INSTITUTIONAL ASPECTS OF RURAL ENERGY PLANNING

Report

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ABBREVIATIONS AND ACRONYMS

AFPRO	Action for Food Production, New Delhi (a voluntary agency)
CASE	Commission for Additional Sources of Energy
CEA	Central Electricity Authority
CEL	Central Electronics Limited (a public sector company)
DNES	Department of Non-conventional Energy Sources, Government of India
GAIL	Gas Authority of India Limited
IIM	Indian Institute of Management
IIP	Indian Institute of Petroleum
IRMA	Institute of Rural Management, Anand
IIT	Indian Institute of Technology
IREDA	Indian Renewable Energy Development Agency
KOEL	Kirloskar Oil Engines Limited
KVIC	Khadi and Village Industries Commission
NABARD	National Bank for Agriculture and Rural Development
NCAER	National Council for Applied Economic Research
NGOs	Non-governmental organizations or voluntary agencies
NRSE	New and Renewable Sources of Energy
ONGC	Oil and Natural Gas Commission
OREDA	Orissa Renewable Energy Development Agency
PGO	Power Generation Organizations
PFC	Power Finance Corporation
PRAD	Planning, Research and Action Division, State Planning Institute, Lucknow, Uttar Pradesh
PSU	Public Sector Units
PV	Photovoltaics
PRI	Panchayati Raj Institutions

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REC	Rural Electrification Corporation
R&D	Research and Development
RETs	Renewable Energy Technologies
SEDA	State Energy Development Agency (also referred to as state nodal agencies)

1. INTRODUCTION

1.1 Objectives

The purpose of this FAO sponsored project on the Institutional Aspects of Rural Energy Planning is to study and assess the existing institutional rural energy planning set up in various countries of the Asian region, and propose a possible framework for institutional co-operation and co-ordination which would promote the convergence between grassroot and regional and national implementation. As mentioned in the terms of reference, this study focuses on proposing a broad framework and guidelines for

i) identifying and assessing the performance of various institutions dealing with different programmes for energy development in the rural areas and planning set up at the government, semi-government and non-government sectors.

ii) examining the existing coordination arrangements between various institutions and the problems and constraints in ensuring the linkages between institutions as a part of the integrated rural energy planning framework which has its roots at grassroots level and goes right up to the national level (through the various district and regional levels).

In this report we have studied and assessed the existing institutional set up for rural energy planning in India. We have focused on developing and applying a framework of analysis to large scale rural energy programmes to understand the institutional issues such as problems of co-operation and co-ordination, the importance of flexibility etc.

1.2 Energy Situation in India

The growth of energy consumption in India over the past four decades has been faster than the growth of population and income. This trend is in keeping with trends seen in most countries going through a process of economic development in the initial stages of rapid industrialization. Consequently, not only has there been a rapid growth of demand for energy in the industrial sector, but in recent years, demand in both agriculture and transport has grown sharply.

The estimated levels of energy supply in India during the fiscal year 1988-89 are approximately 200 billion kWh of power generation, 180 MT of coal production and approximately 50 MT of oil and oil products with almost two-thirds being produced indigenously and the balance being met through imports. Estimates of consumption of non-commercial fuels are not very reliable, but the Energy Demand Screening Group set up by the Planning Commission estimated that in 1984/85 fuelwood consumption was 146.5 MT, dung cake consumption 80.3 MT and crop wastes 45.1 MT.

On the consumption side almost 60 per cent of the total power consumed takes place in the industrial sector with agricultural and household sectors accounting for roughly 18 per cent and 15 per cent respectively. Coal is consumed almost in equal quantities in the industrial and utilities' sectors, both accounting for about 90 per cent of the total coal consumed in the country. The major share of petroleum products goes for transportation purposes among energy using sectors, but almost an equal quantity is utilized as feedstock for fertilizers and petrochemicals, etc.

The current pattern and growth of energy consumption is posing a serious challenge to energy planners, particularly since the capital intensity of the energy supply industry has been increasing rapidly, requiring an increasing share of total investment at the national level for expansion of energy supply capacity. At the same time scarcities of biomass fuels are resulting in crisis situations in several parts of the country. These trends require a vigorous energy conservation approach to energy planning, and it is expected that steps will have to be taken by the government in the next few years to come to grips with raising the efficiency of energy used in the Indian economy.

An examination of the Indian situation reveals that the need for enhancing the energy supply to the rural areas is no longer debated: the recent dilemma for the policy makers and the planners has been to do it optimally under given resource and political parameters. Some of the important rural energy issues in the Indian context revolve around

i) the choice of cooking fuels and stoves for the rural households in the long term as well as in the immediate future to provide clean and convenient cooking energy.

ii) the options to meet additional energy and power demand in the rural areas which are electrified but suffer from chronic power shortages.

iii) the options to meet the energy and power demand in the rural areas which are not electrified.

iv) the planning and management methods for development and dissemination of decentralized technologies based on new and renewable energy resources as well as for improving the energy efficiency in various enduses.

The earlier intervention to improve energy situation in the rural areas was through the rural electrification programme under the Rural Electrification Corporation to supply electricity for agricultural activities and lighting. Though emphasis is laid on providing power for pumping water for agriculture,in the overall situation of power shortage the electricity supply to the rural areas is erratic and inadequate Also, the rural electrification has not always resulted in large scale household electrification or in better services. This situation coupled with the effects of energy crisis in the mid 70's and the concerns regarding deforestation led to promotion of new and renewable sources of energy and more efficient technologies particularly in the rural areas.

i) The Integrated Rural Energy Planning exercise undertaken by the Rural Energy Cell in the Planning Commission (PC), (ii) the National Project on Biogas Development (NPBD), and (iii) National Programme on Improved Chulhas (NPIC), and the Urjagram programmes under the Department of Non-Conventional Energy Sources (DNES), the afforestation programmes initiated by the National Wasteland Development Board (NWDB) are some of the important ongoing energy development programmes in the rural areas. A number of institutions have been set up since 1980 to accelerate the efforts to improve the energy situation in the rural areas so that a rapid improvement in rural economy as well as in the quality of life can occur.

There have been a few studies to examine the institutional aspects of rural energy planning (Pereira, 1988), promotion of renewable energy technologies (Bhatia, 1987), and on promoting large scale manufacture and commercialization of decentralized energy systems in India (CEC, 1988). Pereira proposes a conceptual model for analyzing institutional and organizational aspects of rural energy planning and implementation. He has applied an analytical model consisting of a demand driven contingency tree to demonstrate that the planning process should be adjusted to a typology of demand situations. The target oriented planning approach and the hierarchical institutional framework for implementation have been identified as the major constraints in the promotion of renewable technologies in India (Bhatia, 1987). The CEC study has outlined strategies for commercialization of various decentralized energy systems in India. However, a comprehensive study examining the rural energy situation in the context of overall national situation and other rural development programmes is needed to understand the constraints in implementing programmes to improve rural energy situation. Our study proposes to examine the institutional aspects of rural energy planning and implementation in the Indian context with an emphasis on planning for and management of decentralized energy options.

1.3 Scope of the Study

In chapter two of this report, an overview of the rural development in India is presented to provide a background of the Indian experience in rural development. We have then discussed the existing institutional set up involved in rural energy planning in Chapter 3. A framework for analyzing institutions/programmes involved in developing area based rural energy plans and implementing national energy development programmes is proposed in Chapter 4. In this framework, environment, strategy, structure and processes have been identified as the four key variables influencing the performance of a development programme. In Chapter 5, we have analyzed the National Project on Biogas Development, National Programme of Improved Chulhas and the Biomass Development Programmes using the framework. We have then examined the micro level experiences of some village level energy development projects before discussing the implications of our analysis for the institutional aspects of rural energy planning and implementation in Chapter 6.

2. RURAL DEVELOPMENT PROGRAMMES IN INDIA AN OVERVIEW

2.1 Early Experiments

India has a long tradition of rural reconstruction. Some of the early efforts in India include construction of irrigation tanks and dams by monarchs guided by humanistic and religious values. In the early part of this century particularly during 1920s to 1930s a number of rural reconstruction projects were undertaken by people influenced by nationalism and by a few who were influenced by western social philosophies. Some such early experiments were i) Sriniketan experiment initiated by Tagore, ii) Martandam project by Spencer Hatch, iii) Gurgaon experiment by E.L. Brayne, iv) Baroda Rural Reconstruction Movement initiated by Maharaja Sayaji Rao Gaikwad, and v) Sewagram project conceptualized and implemented by Gandhiji.

Sriniketan project though had high ideals turned out to be a failure, its major weakness being absence of clarity in the experiment's objectives and programmes. It must however be added that a few cluster villages did benefit.

The Martandam experiment aimed at developing high standards of Christian character through group activities and training in citizenship. The project sought to develop the quality of life of people within the radius of a few kilometers. It initiated activities in apiary, animal husbandry, poultry and eradication of illiteracy. In this development experiment, special attention was paid to train field workers and to develop marketing linkages for the co-operatives formed under this project.

E.L. Brayne, who was the Commissioner of Gurgaon drew attention to the problems of coordination in the administrative structure. He pointed out the absence of a central activity which involved coordination of various tasks undertaken by different departments.

The Baroda experiment launched by Maharaja Sayaji Rao Gaikwad was a larger statewide programme covering hundreds of villages. The major achievement was in the eradication of illiteracy.

The major weakness of all the experiments cited above was the inability to link rural development and industrialization (Gaikwad, 1984).

2.2 Programmes After Independence

In this section we briefly explain the major rural development programmes the Community Development Programme, the Integrated Rural Development Programme and Sectoral Programmes.

2.2.1 Community Development Programme: The Community Development Programme (CDP) was born out of the experiences of Grow More Food Campaign based on the recommendations of TTK Committee. It was launched in 1952 on the basis of the following assumptions (Ensminger, 1968).

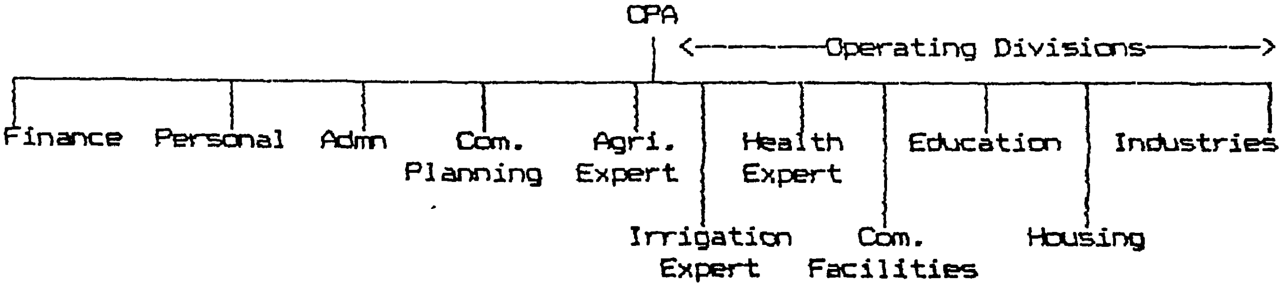
i) The overall development of the rural community can be brought about only with effective participation of the people, backed by the coordination of technical and other services necessary for securing the best from such initiative and self-help. It was to provide the necessary institutional structure and services that early attention was given to the development of basic democratic village institutions like Panchayats, Cooperatives and Village Schools.

ii) The problems of rural development have to be viewed from a holistic perspective and the efforts to solve them have to be multifaceted.

The CDP was launched in 55 project areas with "the purpose of the Community Projects being to serve as a pilot experiment in the establishment of the Right to live; food - the principal item in the wherewithals for this purpose - receiving the primary emphasis in the initial stages of the programme". Owing to political pressure 55 more project areas were added within six months. The activities under the CDP were related to agriculture, communications, education, health, training of farmers and extension staff, social welfare, supplementary employment and housing. Ford Foundation and the Technical Cooperation Administration assisted the Government of India in implementing the CDP.

2.2.1.1 Organizational Structure of CDP: The organizational structure of CDP is outlined below.

Central Level: A central committee for policy support was constituted under the chairmanship of the Prime Minister with the members of the Planning Commission and the Minister of Food and Agriculture designated as members. A Community Projects Administration (CPA) was appointed and all development ministries were required to collaborate with the CPA. CPA structure was as follows:



Currently the CDP is under the Ministry of Agriculture and Rural Development.

State Level: The organization was based on the central model with the state level counterparts becoming members. A development commissioner (Principal Secretary, Agriculture/Agricultural Production Commissioner) coordinates the programme.

District Level: The district level has a district development board under the chairmanship of the district collector with the district heads of departments as members. A district development officer (DDO) of the rank of additional collector is entrusted with the responsibility of coordination. He is assisted by specialist officers of various departments. The DDO works under the advice of the development board. The states which had adopted the Panchayati Raj formed the structure of Zilla Parishads (ZP) as required by the act. The DDO acts as the Secretary to the ZP and an elected non-official is the chairman of the ZP (Organizational analysis of the Panchayati Raj is presented elsewhere).

Block and Village Level: The BDO is in charge of the implementation of the CDP at the block level. The block as a unit of rural development administration emerged on the basis of the recommendations in the "Report of the Famine Inquiry Commission (1945) and the Draft Outline of the First Five Year Plan (1951). The BDO is assisted by extension officers (EO) in the fields of agriculture, animal husbandry, rural engg. public health, cooperation, social education, women's and children s programmes, rural industries. In states that have adopted Panchayati Raj the BDO also doubles as the Secretary of the Block Parishad/Block Panchayat Samiti. At the village level about ten village level workers (VLWs)/Gram Sevaks and two Gram Sevikas look after a cluster of villages. In many states where Panchayati Raj has been introduced the VLW works as the Panchayat Secretary.

2.2.1.2 Shortcomings of the CDP: Some of the shortcomings of the CDP are i) It failed on the agricultural front. Agricultural production did not increase as anticipated. The failure has been attributed to two reasons:

a) Agricultural pricing policy was not producer oriented as the emphasis was on cheap food to people. This acted as a disincentive to farmers to produce more.

b) A more realistic time period for self-sufficiency in food production is 25 years and not 15 years (Ensminger, 1972).

ii) The CDP employed extension workers were not trained to meet their tasks and could not offer help or assistance to the farmers.

iii) Interdepartmental conflicts and poor functional responsibility at block level reduced the effectiveness of CDP.

2.2.1.3: Important Lessons from CDP: However, the CDP had some important lessons to offer which in a nutshell are as follows:

i) Blue print approach has limitations in replication of pilot projects.

ii) It revealed "the lack of adequate management analysis in the planning process; insufficient management competence in 'nation building' departments; and the short supply of professional managers for local enterprises and agencies which provide the essential services for development programmes at the final point of application" (Katar Singh, 1986).

The CDP in essence, provided the basic organizational structure for development and growth of rural India.

2.2.2 Sectoral Programmes (Special Group & Area Specific Programmes): Most of the programmes formulated by the Government in the 1960s were growth oriented. Evaluation of the growth oriented programmes indicated that an appreciable impact was not made in eradicating rural poverty. It was also realized that distribution of benefits was skewed and was not equitable. "Trickle Down Theory" was not held valid any longer. This led to the formulation of special group and area specific programmes like Small Farmer Development Agency (SFDA), Marginal Farmers and Agricultural Labourers (MFAL) programme, The Drought Prone Area Programme (DPAP), the Desert Development Programme (DDP), Hill Area Development Programme (HADP) and various employment related programmes like Central Scheme for Rural Employment (CSRE), Pilot Intensive Rural Employment Project (PIREP), Employment Guarantee Scheme (EGS) of Maharashtra. To increase the social consumption of the rural poor a Minimum Needs Programme was launched. The strategy behind launching the special group programmes can be captured in a point made by Mrs. Gandhi in her address to the Institute of Economic Growth "Planning was chosen as a method to attack the problem of poverty. Hence our special programmes designed to meet the problems of the poor......the rationale is not charity not providing temporary relief or doles (but) strengthening the productive capacity of those who today produce very little.

2.2.3 Integrated Rural Development Programme (IRDP): The IRDP was launched in 1978-79 in 2300 selected blocks in the country with the following objectives:

i) To provide income generating assets to rural poor.

ii) To create supplementary wage opportunities for rural poor who are assetless.

The IRDP aims to redistribute assets and employment opportunities in favour of the rural poor enabling them to rise above the poverty line. The target group of IRDP consists of the poorest of the rural poor viz.

the small and marginal farmers, agricultural and non-agricultural labourers, rural artisans and craftsmen and economically weaker sections of the society.

The IRDP uses the following approaches in implementation.

i) The cluster approach to select villages to ensure supporting infrastructure.

ii) The antyodaya approach to select beneficiaries so that the poorest of the poor get benefits.

iii) The package approach so that the related services and inputs can be used in full.

The organizational structure of the IRDP follows the standard bureaucratic form, the minor difference being the establishment of an autonomous agency called the District Rural Development Agency (DRDA). At the national level, the Department of Rural Development is responsible for management of the programme.

IRDP is being evaluated by many organizations currently. Some important points that emerge from such evaluation are as follows:

i) The objectives and magnitude of the programme calls for implementation with staff who are trained and compensated well.

ii) Backward and forward linkages with other sectoral programmes should be established to make available inputs.

iii) Rural development efforts call for involvement of a variety of organizations like farmers' organizations, research and training organizations, financial institutions.

2.2.4 Voluntary Organizations in India: Voluntary efforts in India got a spurt on account of the consciousness created during the independence struggle. The Sarvodaya movement inspired by Gandhian though drew thousands of committed workers. After independence the Bihar famine and the Maharashtra famine attracted youth to participate in voluntary efforts. Voluntary organizations in India can be broadly categorized in three categories:

i) Grassroots NGOs

ii) Professionally Skilled NGOs: These are small but professionally staffed NGOs which assist grassroots NGOs in programme formulation and implementation.

iii) Large NGOs: These are involved in a variety of development programmes and have sizable infrastructure and staff.

The dilemma that Indian NGOs face are many which have not been dealt here as they are beyond the scope of this study.

2.3 Panchayati Raj Institutions in India

Just as the CDP launched by the Government of India provided the basic framework for rural development in India, the Panchayati Raj institutions (PRI)/local government institutions are the foundations of grassroots participation in rural development. The PRIs have an ideological and organizational link with the CDP.

Recognizing the need for community participation in the implementation of the CDP, project level advisory committees consisting of non-officials in project areas (Planning Commission, first Five Year Plan) were set up. However, the following lacunae were noticed in implementation.

i) CDP turned out to be a "government programme" rather than people's programme with the government's support (Dayal, 1970).

ii) The project advisory committees set up lacked the authority to influence decision making.

iii) Many states did not have any formal organization at the block level to provide feedback and represent the people.

Against this background a study team headed by Balvantray Mehta was set up in 1957 with the following objectives.

i) To study the extent to which the CDP has succeeded in tapping people's initiative.

ii) To look into the aspects of formation of new institutions that ensures a continuity in the process of socio-economic change (Committee on Plan Projects, Report, New Delhi, 1957).

The Committee recommended a three-tier system called Panchayati Raj "a system, a style of government of the state" (Pandit Nehru) namely, the village panchayat, the panchayat samiti and the ZP and recommended that the entire development work should be transferred to these bodies. (Committee on Plan Projects, Report, 1957).

Certain basic rationale governed the formation of the Panchayati Raj Institutions which are as follows:

i) To make community development programmes relevant to the needs and problems of the people.

ii) To transfer decision-making authority to villagers regarding developmental work.

iii) Values of participatory democracy (Dubey, 1970)

2.3.1 Organizational Conflicts in Panchayati Raj: Organizational conflicts in Panchayati institutions basically occur:

i) Within the block administration, namely between the personnel.

ii) Between the block administration and the Panchayat Samiti. Organization specialists who have studied bureaucracies have focussed on the structural characteristics of such organizations and point out that they create strains on the organization (Delton, 1960).

Presently, there are 4526 Panchayat Samitis at the block/tehsil level covering 88 per cent of the blocks in the country and 330 have ZPs which cover 76 percent of the districts (CAAD report G V K Rao Committee, 1985). The poor state of affairs of PRI's in India can be attributed to the fact that the State Governments have not relinquished control of planning, decision making and funding to PRIs. Despite this the states of Andhra Pradesh, Karnataka and Maharashtra have introduced changes which are interesting. In the oncoming sections we briefly explain the features of the PRIs in these states.

2.3.2 PRI in Andhra Pradesh: At the district level there are two sectors namely development and regulatory. While the former is directly under the control of the District Collector, the latter is ultimately under the District Collector. The earlier Zilla (District) Development Board which was headed by a bureaucrat was abolished on the grounds that it made the role of people's representation and the Zilla Parishad redundant. Instead it was replaced by a District Planning Board which was headed by a Minister nominated by the Chief Minister and includes the Chairman, ZP, the District Collector, MLA's and MPs in the district and other persons (not more than 15) nominated by the Government. 'Mandals' have also been formed for groups of villages based on population criteria. Revenue Mandals replace the Taluks and Firkas for regulatory and Panchayat Samitis in development administration. Mandal Panchayats are being considered in place of Panchayat Samitis with Gram Sabhas at the village level and ZP at the district level.

2.3.3 PRIs in Maharashtra: The Zilla Parishad at district level is considered the key tier in local administration. Elected councilors are members of the ZP. The committee does not include MPs, MLCs and MLAs. The ZP is totally dependent on the State Government for finances. A Chief Executive Officer who is from the Civil Service is the overall in-charge. The BDO plays the same role with regard to the Panchayat Samiti. ZPs in Maharashtra are under he control of the Government and most of centrally sponsored development schemes are outside the purview of the ZP even though they have a role in implementation. The planning functions are entrusted to a separate non-statutory body called District Planning and Development Council (DPDC) outside the ZP.

2.3.4 PRIs in Karnataka: In Karnataka the PRIs have the following bodies namely, the Zilla Parishad, Taluka Panchayat Samiti and the Mandal Panchayat with the Gram Sabha at the village level and the Nyaya Panchayats at the Mandal level. The important bodies are the ZP and the Mandal Panchayat. The ZP is district level body and is composed of elected,associate and nominated members. MPs, MLAs and MLCs are included in the body. The Adhyaksha of the ZP is elected from amongst the members of the ZP for a five year term and is of the rank of Minister of State. The Chief Executive Officer of the ZP is called the Chief Secretary and is expected to serve as a link pin between the elected wing of the ZP and its bureaucracy. The Chief Secretary of the ZP is also expected to be a link between the ZP and the State Government and is drawn from the civil

ZP. Its main function is formulation and execution of district plans. The State Government has invested the ZP with wide powers of monitoring and control over the functions of mandal panchayats, which is a wholly elected body of about 20 members. It has obligatory, discretionary and transferred functions. Its range of functions are limited and works under the control of the ZP. The Taluka Panchayat Samiti consists of ex-officio members of the Taluka under the local MLA and is expected to coordinate the activities of the Mandals. The State Government is proposing to vest taxing powers to the ZP in future.

To conclude, the AP model of Panchayati Raj has integrated regulatory bureaucracy, development administration and the elected representatives. On the other hand the Maharashtra and Karnataka models emphasize the importance of ZPs and have separated the regulatory and development activities. The significant difference between the two models is that the Karnataka model is a quantum jump in decentralization while the Maharashtra model still indicates strict controls of the State Government.

2.3.5 Proposed changes:

With a view to strengthening the PRIs, the government had proposed the 64th Constitution Amendment Bill, the main features of which are as below (Indira Hirway, 1989).

(i) All states will have three tier panchayati raj system which will include panchayat bodies at village, intermediate and district levels. Small states with less than 20 lakh population may not, however, have the intermediate tier.

(ii) Regular mandatory elections will be held every five years for these PR bodies under the control and supervision of the Chief Election Commissioner. If a PR body is dismissed for some reason, it must be reconstituted through a proper election within six months.

(iii) All seats in all PR bodies will be through direct elections, and office bearers will be from the directly elected members only. State legislatures may appoint MPs, MLAs and others in PR bodies for their representation in the panchayats.

(iv) 30 per cent seats in PR bodies will be reserved for women. Reservation of seats for SC/ST will be proportion to their population in the total population.

(v) PR bodies will receive their finances from state governments (in the form of grants) They will also be able to earn revenue by imposing taxes, duties, tolls and fees on the commodities falling under their purview. State finance commissions will review the finances of PR bodies every five years.

(vi) PR bodies will prepare plans for economic development, social justice and social welfare of their population as per the given guidelines. These plans will be incorporated later on in state plans.

(vii) Strict accounting procedures will be laid down to control corruption and misuse of funds by panchayats. Comptroller and Auditor General of India will supervise the accounts.

The bill however was defeated in the parliament. With a change in the government

3. INSTITUTIONAL ASPECTS OF RURAL ENERGY PLANNING IN INDIA

In this chapter, we have outlined the national level institutions involved in the formulation of energy policies and plans in India. We have discussed the process of policy and plan formulation at the national level. At the state level, mechanisms involved in preparing the regional plans and in implementing them are discussed with a focus on information flow, financial controls and feedback mechanisms. In the last section, the role of other important institutions involved in the activities related to rural energy planning and implementation is explained and analyzed.

3.1 Institutions at the Central Government Level

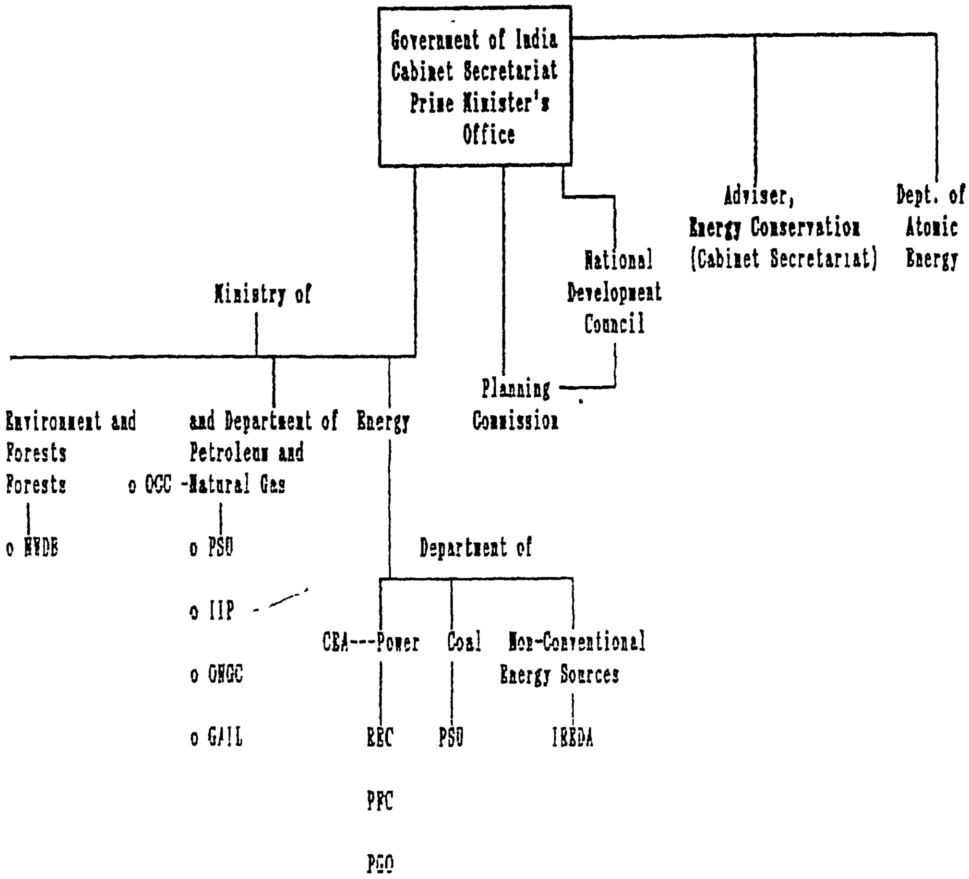
Fig. 3.1.1 schematically represents most of the important institutions involved in the process of formulation of energy policies and plans. The Planning Commission (PC) is responsible for directing the overall planning effort in the country. The programmes of all the central departments as well as those of the state governments are approved by the PC. It provides policy support and centre-state linkage. Typically, broad policies are evolved by the various working groups formed by the Planning Commission. The various departments then prepare detailed plans in the context of guidelines from the Planning Commission. Here again working groups on various subjects are formed and these include experts in the area from all over the country. The plans are finally approved by the cabinet secretariat. The plan period is 5 years. Currently, preparations for the 8th plan (1991-1995) are in progress.

The subsequent sections provide a brief overview of national level organizations directly involved in rural energy development. They are as below:-

i) the rural energy division of the Planning Commission
ii) the Department of Non-conventional Energy Sources
iii) the National Wasteland Development Board
iv) the Rural Electrification Corporation are described.

3.1.1 **The Planning Commission (Rural Energy Division):** The Integrated Rural Energy Programme (IREP) is a major intervention of the PC to improve the rural energy situation. It was suggested in the Sixth Plan (1981-85) on a pilot basis in some states for gaining experience on methods of providing an optimal mix of energy options for meeting the diverse needs of rural India in the most cost-effective manner. The IREP started in 1981 in four states and was extended to five more states in 1984-85. The pilot projects were implemented in three phases in the chosen state, where Phase 1 involved setting up of a working group to prepare a project paper on the rural energy problem in the state. In Phase 2 the districts and blocks for preparing pilot IREP programmes were identified and integrated rural energy programmes were prepared. The guidelines for preparing the programmes were broad and very general; main energy options were windmills, solar cookers, water heating systems, improved chulhas, improved bullock carts etc. Subsidies were provided to break initial barriers and were to be reduced or increased depending on the response of the beneficiaries. These incentives were a part of a comprehensive project to change the existing energy consumption pattern to a desired pattern for the block as a whole. Phase 3 involved implementing the pilot IREP programmes.

Fig. 3.1.1: Institutions Involved in the Formulation of Energy Policy and Plans in India



By the end of the Sixth Plan period a total of 20 blocks had IRE programmes at various stages of implementation at a cost of Rs. 4. crores.

The emphasis during this period was to develop a methodology design IREP programmes at the block level and to evolve an institution mechanism at the state, district, block and village level to plan a implement the IREP programme. Thus state and district cells we established for coordinating and implementing the programme. During tl Sixth Plan the nodal department at the state level varied from state 1 state and at the district level the project cell was looked after by tl District Magistrate or the Zilla Parishad or the DRDA. At the bloc level, the block development officer (BDO) was involved in the implementation.

The Seventh Plan document refers to the following lessons from the pilot IREP programme during the Sixth Plan.

i) The inter-dependent nature of the IREP involving many government departments caused problems of coordination. Hence, the need for an institutional mechanism for both planning and implementation at the state and district level was felt.

ii) A shortage of expertise for both planning and implementation was identified as one of the constraints.

iii) The need for involving local bodies and people was realized and it was suggested that working groups with the involvement of village panchayat, local schools, colleges etc. be set up.

iv) The importance of monitoring the technologies and other parts was realized.

Based on these lessons during the Seventh Plan (i.e. 1986-90) following sub-components were included in the IREP programme.

i) Institutional mechanism in the states/UTs: State Cells consisting of professional economists and engineering and other supporting staff would be created in a suitable nodal department at the state level such as the planning department, for coordinating and directing the programme in the states. District/block cells are set up under the IREP block level projects.

ii) Training: A major training programme has been developed and launched by the planning commission for motivating and training professionals for planning and implementation of the IREP programme at the state, district, block and village levels. Regular orientation and refresher courses are organized for project staff. A National Centre on Rural Energy Planning is in the process of being set up to impart specialized training in integrated rural energy planning.

iii) Project Preparation: Necessary expertise is created and guidance provided to them to prepare area-based integrated rural energy plans for the programmes. Technical assistance for this purpose is now provided on a regular basis by the Planning Commission to the states in preparing such documents.

iv) Implementation of Projects: Implementation of the IREP projects would consist of demonstration programmes on various energy technologies, extension through involvement of voluntary, non-official and other organizations and participation of local institutions including banks, R and D institutions, industries etc., for achieving targets set out in the IREP plan as well as coordination with different energy supply departments.

v) Incentives and subsidies for IREP Programme: Incentives and subsidies are provided from the state plan to supplement, if necessary, existing subsidies provided through ongoing programmes. The subsidy levels are periodically fixed and modified on the basis of the IREP plan and the performance in the IREP projects.

vi) Monitoring: Based on the Sixth Plan experience a computerized monitoring system has been set up in the planning commission to monitor the physical and financial progress of the IREP projects and status of the programme in the states and provide regular guidelines to the states accordingly.

vii) Setting up of Computer Model: A large computer model has been set up in the Planning Commission for the IREP programme for policy and investment planning for the Rural Energy Sector at the National Level.

During the Seventh Plan period, the number of projects would be progressively increased every year so that by the end of the Seventh Plan, atleast 100 block level IREP projects would be set up. Higher number of projects in hill states and backward areas are envisaged.

The Planning Commission would continue to develop the IREP through the Seventh Plan period after which it would be handed over to an operating department as a regular programme.

The Financial Outlays for 7th Plan

As mentioned earlier, the total expenditure incurred during the Sixth Plan was Rs. 4.13 crores. During the Seventh Plan the financial outlay has been increased nearly eleven fold to Rs. 47.76 crores. The financial outlay was divided into two parts: a Central Government outlay of Rs. 5.91 crore (for the Rural Energy Cell, Planning Commission) and the State/Union Territory outlay of 41.85 crores (Rs. 37.15 crore for states and Rs. 4.70 crore for Union Territories).

At the central level, the allocated funds are to be used for

	Items	Detail	Amount (Rs.Crore)
1.	Developing institutional mechanism	Salaries etc. for professional at state level	3.50
2.	Training	Establishing a National Training Centre	1.50
3.	Project preparation	Technical guidance to states	0.50
4.	Monitoring	---	0.41
		Total	5.91

Detailed itemwise allocation of funds at the state/UT level is not available though it is understood to be available for the following

i) Project preparation

ii) Project implementation including demonstration and extension programmes

iii) Grants to local institution/industries

iv) Subsidies

3.1.2 **The Commission for Additional Sources of Energy (CASE) and the Department of Non-Conventional Energy Sources (DNES):** In March 1981, the Government of India established a high powered commission called "The Commission for Additional Sources of Energy" for the purpose of promoting new and renewable sources of energy (NRSE). For about a year and a half after its formation CASE functioned from and through the Department of Science and Technology and was given the responsibility of formulating policies and programmes for development of NRSE, coordinating and intensifying R&D activities in this area and ensuring the implementation of government policy in regard to all matters relating to NRSE. The CASE was also expected to provide a link between R&D and production by promoting the acquisition of technical capacity and providing finances for the development and rapid commercialization of NRSE. Also in its brief was policy relating to subsidies, technology import, formulating licensing procedure etc. Thus the Cabinet Secretariat Resolution (No. 64/1/3/82 Cab dated 23rd October, 1982) gave CASE the power to formulate and implement all policies pertaining to NRSE. The members of CASE are - Secretary, Department of Expenditure in the Ministry of Finance; Secretary, Department of Power; Chairman, KVIC; Secretary, Department of Science and Technology and the Director-General of the Indian Council of Agricultural Research. But one and a half month prior to this amended resolution, the Government created the Department of Non-Conventional

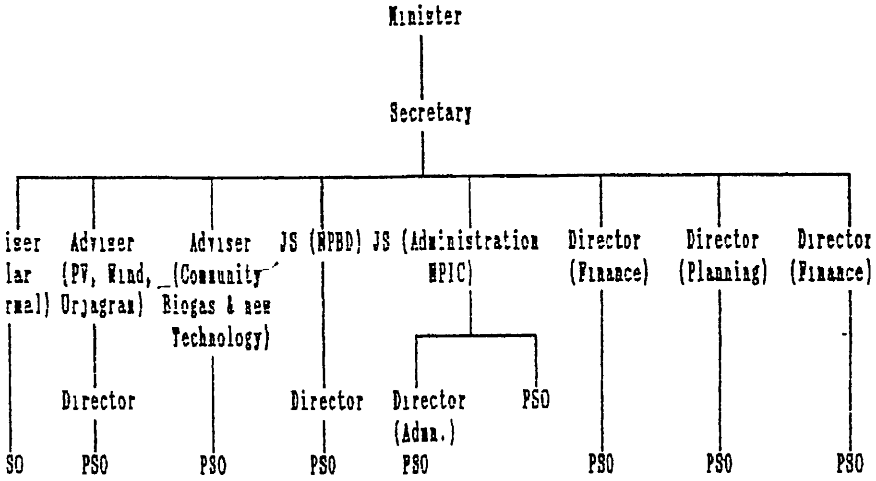
Energy Sources (DNES) on 6th September, 1982. In allocation of Business Rules, the government assigned the DNES with the primary responsibility of CASE. Secretary, DNES also became the Chairman of CASE. With the transfer of biogas (National Project of Biogas Development) from the Ministry of Agriculture, DNES and CASE between them have the overall responsibility in all matters pertaining to new and renewable sources of energy.

DNES has several divisions which look after the promotion of different technologies (Fig. 3.1.2.1) based on new and renewable energy resources. DNES has also set up its regional offices in a few states to accelerate the promotion activities and to co-ordinate the activities of different agencies. They also act as monitoring centres to provide feedback to DNES on the status and quality of implementation. The Principal Scientific Officer in a division is primarily responsible for developing various programmes. He is assisted by technical advisors within the department and also by the experts from other institutions. There are special mechanisms to deal with extension programmes and research and development programmes.

Many of the programmes of this department have a rural focus, important among them being the National Project on Biogas Development (NPBD), the National Programme of Improved Chulhas (NPIC), The Urjagram Programme etc. While DNES controls the funds and also develops programmes for implementation, the programmes are implemented through state energy development agencies or through other state nodal agencies. In its implementation strategy, the department follows a target oriented strategy. Targets are fixed annually after the annual budget is prepared and approved. The state nodal agencies are then allocated their targets.

Inspite of the awareness and sensitivities of the concerned officials, the rush to spend money towards the end of the financial year (i.e, March) appears inevitable. The organizational structures for large programmes will be discussed while analyzing these programmes in the next section.

Fig. 3.1.2.1: Organisational Chart of the Department of Non-Conventional Energy Sources (DNES)



- Joint Secretary, PSO - Principal Scientific Officer,

In the Sixth Plan period (1980-84), the expenditure on the New and Renewable Sources of Energy (NRSE) was Rs. 151.7 crore against the allocation of Rs. 100 crores.

Indian Renewable Energy Development Agency: IREDA is established in early 1987 under the administrative control of the DNES as an instrument for promoting, developing and financing new and renewable sources of energy technologies to accelerate the momentum of development and large scale utilization of renewable energy sources. During its first year of operation 35 projects were received and 19 involving a loan of Rs.2.7 crores were sanctioned by involving financial institutions such as IDBI, IFCI, ICICI and state level financial corporations. The projects sanctioned are in the area of biomass utilization, solar thermal energy, generation of biogas/power from natural effluents etc.

3.1.3 National Wasteland Development Board (NWDB): The National Wasteland Development Board, when established in May 1985, was envisaged to be the nodal agency for the inter-departmental afforestation programmes. It was expected to formulate and coordinate all afforestation programmes and give a special emphasis on fuelwood and fodder. The target set for it by the Prime Minister was afforestating a massive 5 million hectares a year; through a peoples movement at an estimated fund requirement of Rs. 2500 crores a year.

At the central level, funding for afforestation comes mainly from the Ministry of Environment and Forests and the Department of Rural Development under the Ministry of Agricultural and Rural Development.

At the state level there are numerous schemes with fund allocation for afforestation (one state reports the existence of 27 schemes), In such a situation the afforestation programme lacks direction and coherence. NWDB has been wound up and a Technology Mission has been formed in 1989.

3.1.4 Rural Electrifiction Corporation: The Rural Electrification Corporation was set up about 19 years ago to finance projects to electrify rural areas. The emphasis has been on energizing irrigation pumps for pumping ground water for irrigating farms. Secondary objective is the provision of electricity for commercial, domestic and small industrial consumers in the villages, in order to improve employment possibilities and the quality of life in rural areas.

The rural sector consumes about 20 per cent of the total energy consumption in the country at present. Out of the 5,75,126 villages, as on 31st March, 1988 more than 75 per cent of villages have been electrified covering 69.9 per cent of the rural population. Some of the states (Punjab, Haryana, Tamil Nadu, Himachal Pradesh, Kerala, Karnataka, Gujarat and Nagaland) have achieved 100 per cent electrification, though it does not ensure either the supply or the 100 per cent household connections. There are also more than 72 lakh electric pumpsets. The REC can now fund decentralized small/mini/micro hydel and mini gas turbine projects for power generation.

In 1987-88, the financial outlay for REC was Rs. 1028 crores.

Some of the problems associated with rural electrification are

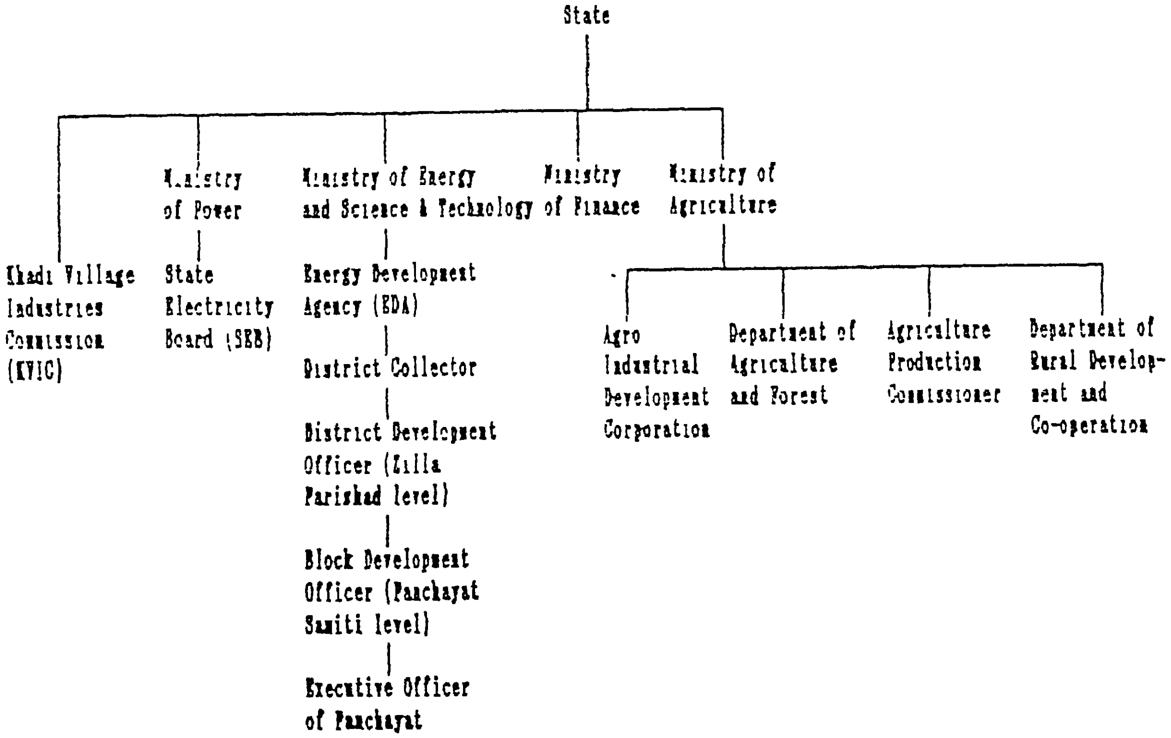
i) inadequate supply of power;
ii) the rural load is seasonal;
iii) inability to generate additional load in the rural area;
iv) the theft of power.

Recently, studies have been carried out to examine viable options based on renewable energy resources for supply of energy for pumping, rural industry, domestic/commercial services and street lighting. It is found that the solutions are site specific (TERI, 1988). It may be mentioned that the linkages between such policy studies and the process of implementation are still weak.

3.2 State Level Institutes

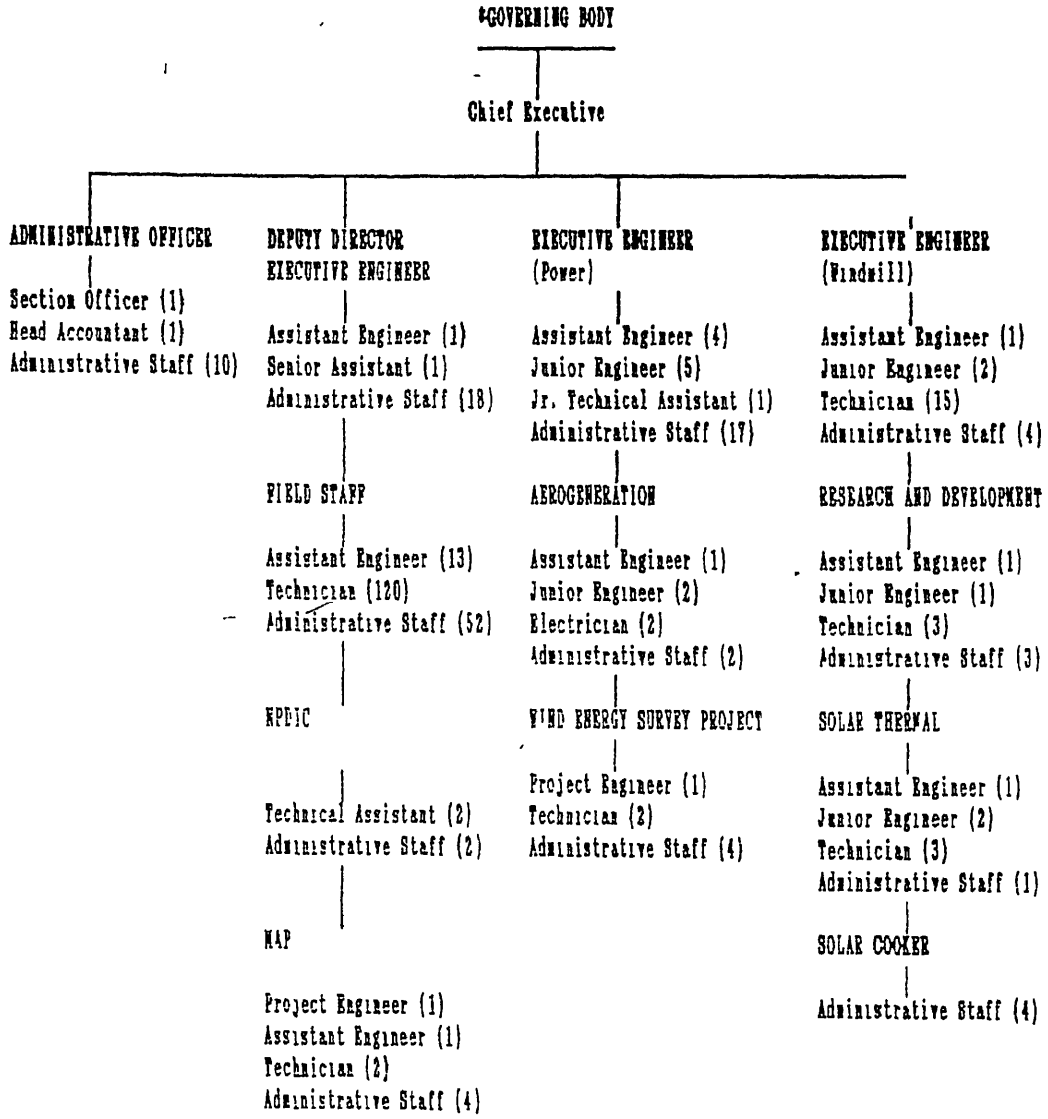
A number of state governments have set up agencies (SEDAs) for the purpose of promoting the renewable energy sources. These are the nodal agencies for the DNES at the state level. They are responsible for planning, implementation, monitoring and evaluation of renewable energy programmes in their states. In addition, a number of other departments are also involved in energy development at the state level. A typical set of organizations is illustrated in Fig. 3.2.1. In most cases the state government acts as an implementing agency of the national level policy with or without additional subsidy given by the government. In Fig. 3.2.2 organizational chart for one of the state level energy development agency is shown.

Fig. 3.2.1 Energy Organisation at State Level


State
Ministry of Power
Ministry of Energy and Science & Technology
Ministry of Finance
Ministry of Agriculture
Khadi Village Industries Commission (KVIC)
State Electricity Board (SEB)
Energy Development Agency (EDA)
District Collector
District Development Officer (Zilla Parishad level)
Block Development Officer (Panchayat Samiti level)
Executive Officer of Panchayat
Agro Industrial Development Corporation
Department of Agriculture and Forest
Agriculture Production Commissioner
Department of Rural Development and Co-operation

Source: Bhatia (1987)

Figure 3.2.2: Organisational Chart of Orissa Renewable Energy Development Agency



Notes: NPIC - National Programme on Development of Improved Chulhas.

* Governing body consists of Chairman (Chief Secretary); Secretary (Irrigation and Power); Secretary (Science and Technology); Chief Executive, Financial Adviser (Science and Technology).

Source: Bhatia (1987)

3.3 Other Agencies

Since the area of renewable energy development is still in a nascent stage there are a number of organizations working in the area of development, manufacture and promotion of renewable energy technologies. Some of these are listed in Table 3.3.1. .mb10

Table 3.3.1: Some of the Organizations Involved in the Development, Manufacture and Promotion of Energy Efficient and, New and Renewable Energy Technologies

Organization	Nature of Involvement
Technology Development	
Tata Energy Research Institute, New Delhi	Biogas, Gasifier
Indian Institute of Science, New Delhi	Gasifier, Improved Chulha
Indian Institute of Technology, Bombay	Gasifier
Indian Institute of Technology, New Delhi	Gasifier, Improved Chulha
Agricultural Tool Research Centre, Bardoli	Biogas, Improved Chulha
Solar Energy Centre (DNES), New Delhi	
Technology Manufacture	
Central Electronics Limited	PV Systems
Development Alternatives	Improved Chulhas
Kirloskar Oil Engines	Biogas Duel Fuel Engine
Rajasthan Energy Industries Limited	PV Systems
Promotion	
Khadi Village Industries Commission, Bombay	Floating Dome Biogas Plant Installation
Action for Food Programme, New Delhi	Training for Fixed Dome Biogas Plant Construction
Society for Promotion of Wasteland Development, New Delhi	Afforestation
National Dairy Development Board, Anand	Tree Grower's Cooperatives
Application of Science and Technology to Rural Areas, I.I.Sc., Bangalore	Chulhas and Research, Development, pilot demonstration and monitoring of energy technologies
Tata Energy Research Institute, New Delhi	Pilot demonstration and monitoring of energy technologies
Central Institute of Agricultural Engineering, Bhopal	Pilot demonstration and monitoring of energy technologies

The list given in the table is only an illustrative one, and the number is much larger. An exhaustive list is given in a recent report (CEC, 1988). Some of the non-governmental institutions involved in dissemination are interested in i) monitoring the performance of technology, ii) developing more viable dissemination packages and iii) using the field experiences to develop research strategies to solve the rural energy problems. Other institutions concentrate on the training aspects and also the technology development aspects. These are supported by the DNES and work closely with the state nodal agencies. The manufacturers also depend on the DNES for the market as most of these technologies are subsidized.

3.4 Conclusions

Most of the institutions outlined above have been set up to develop plans and programmes to meet part of the policy objectives mentioned in the Seventh Plan Document, some of which are -

i) to increase energy supply to all sectors of economy;

ii) to increase self-reliance in energy particularly at the rural level;

iii) to encourage energy substitution through renewable sources wherever possible;

iv) to improve the pattern of distribution of energy .... to bring about greater social equity and more balanced regional development;

v) to contribute towards better ecology, preservation of forests and biomass cover and to reduce the existing hazards to health and environment;

vi) to simulate economic activity and employment generation and to improve the quality of life particularly in the rural areas.

In view of these objectives and the rural energy issues outlined in Chapter 1 it is possible to examine the planning process and the ongoing programmes.

In the planning process, the dilemma between the renewable path as opposed to the conventional path for energy development has not been addressed to provide clear guidelines for programme development and implementation. The situation is particularly tricky for enduses like lighting, pumping etc. whose energy needs are currently met in 75% of the villages by electricity. It is not unusual to find villages having PV lighting as well as electric lighting. There is also a concern in the minds of users that the renewable energy supply is constrained by the size of the system whereas the grid supply can be unlimited in the long run. Though a few studies have been made, an approach is still to emerge to decide -

i) how to define a village as electrified;

ii) what are the minimum enduses to be satisfied by renewable energy devices;

iii) the economic and financial viability of various technology-enduse combinations.

The situation in meeting the cooking energy needs is also similar with no clear long term objectives. Here the rural-urban linkages become more critical. The biomass fuels are synonymous to rural fuels and the better quality liquid fuels are considered as urban options. This has created problems because as rural areas develop economically, the quality of life becomes urbanized and the demand for better quality fuels increases. The present planning process does not seem to take into account this user perspective, as a result of which efforts to develop clean, efficient biomass cooking systems are scanty.

Since the entire planning process is centralized, the state level agencies act more as implementing agencies. The financial control is with the DNES and most programmes are target oriented. This has resulted in unrealistic targets and faulty implementation. Even in places where implementation quality is satisfactory, the necessary management structure to maintain the systems is yet at a subcritical level. Lastly, though evaluations have been carried out by the department, adequate information exchange even among the experts does not take place. As a result of this, the identification of the problems and the corrective measures are rarely discussed widely.

4. FRAMEWORK OF ANALYSIS FOR IMPLEMENTATION PROGRAMMES

The framework of analysis which we intend using for analyzing some of the energy development programmes is based on the thesis that the performance of a programme is a function of the four key variables described below.

1. **Environment:** The forces external to a development programme which create opportunities and constraints for its survival and expansion form the environment in which a programme is formulated and implemented. The socio-economic, political, cultural background of a country, features of the beneficiaries, and other elements external to the programme are part of the programme environment.

2. **Strategy:** The long term choices concerning a programme's goals, design of service, policies and action plans constitute a programme's strategy. For example, choosing a single goal vs. multiple goals for a programme is an important element of a strategy.

The two major aspects of strategy are - i) project formulation which is a rational process of matching environmental opportunities, organizational capabilities and programme objectives and ii) methodology of implementation.

3. **Structure:** The durable arrangements, distribution of authority and functions within and between implementing agencies and the coordination mechanisms for achieving the tasks defined by strategy form the structure of a programme.

4. **Processes:** The process variable implies the instruments, policies and procedures that influence the behaviour of functionaries and

beneficiaries in a given development programme. They support the structure by providing information and incentives to people within the organizations and to beneficiaries for doing what the policies indicate must be done.

Earlier research of enterprise organizations indicate that a positive correlation exists between performance of an organization and the positive interaction or synergetic effects of the above variables. In other words, the more 'synergetic' the above variables are, the better is the performance of the organization.

In addition, certain other features of the above four variables are important.

i) The variables interact and are not independent.

ii) The programme managers can influence these variables to improve the performance of a programme.

iii) By influencing one variable, an improved performance cannot be expected. It should be emphasized that a positive interaction effects of all the variables is important.

In the following section we discuss the important elements of each variable.

4.1 Environment

While it is fairly easy to carry out an analysis of the environment in the case of a commercial programme by applying the concept of marketing segmentation, it is quite difficult in the case of development programmes. Analyzing the programme environment is an essential condition for designing the strategy and organizational structure of a programme. Environmental assessment becomes critical at the pilot stage of a programme, during replication stage and implementation stage.

Environmental analysis can be carried out in the following manner.

i) Diagnosis of the problem of the sector or services.

ii) Identification of the programme's beneficiaries and clients.

iii) Key actors influencing demand and supply

iv) Analysis of the environment on the components diversity and uncertainty and scope.

1. Diversity: Most development programmes operate in areas which are not homogeneous in their physical, social, economic and cultural characteristics. As diversity increases, the problems of mobilizing demand and supply of services also becomes complex. Diversity also has an impact on the design of structures.

2. Uncertainty: Environments are not stable. Political, economic, geographical conditions of the beneficiaries keep changing. The more the change, the more the uncertainty.

3. Scope: A pilot programme has limited scope than a national programme i.e. the size of the programme gives some idea about the scope. In addition, the scope of a multi-sector programme is more than a single sector national programme. As the scope increases strategic choices, structures are also influenced and have to be tailored to suit the scope.

It should also be noted that the three components of environment described above do not move together. The environment variable influences the programme performance in two ways:

i) through the dimension of its intrinsic complexity.

ii) through its interaction with other variables which are more under the control of programme managers

4.2 Strategy

Strategic decisions are basically long term decisions about operating goals, policies and action plans of a programme. The degree of freedom a manager of a development programme has, to take decisions of a strategic nature varies from programme to programme. Strategy of a development programme is influenced by

i) the objectives of the programme, and

ii) the programme environment.

In a development programme which has multiple social goals, both the environment and goals tend to be very complex. This leads to conflict over resource allocation, and structural problems. In such a situation the manager tends to choose a dominant operating goal as part of his strategy.

The following two symbiotic components constitute strategy.

i) The "Service-Beneficiary-Sequence (S-B-S)" component which focuses on the goals.

ii) The "Demand-supply-resource (D-S-R)" component which is concerned with tasks (Paul, 1982).

1. **S-B-S Component:** This component basically attempts to answer the following three questions:

i) What is the service or output of the programmes?

ii) For whom is it developed?

iii) When and where is the service to be provided?

Answering the above questions facilitates the analysis of development programme strategies. These elements of the S-B-S component are described below.

Service: Development programmes could offer single or multiple services. Service of a programme is defined as the output that is made available to beneficiaries in consistence with the objectives of the programme. For example, installation of a biogas plant cannot be called a service, but the interrelated activities like identification of the beneficiaries, construction, maintenance of the plant and training of the masons and the beneficiary one part of the service. It should be noted that single output, multiple input will be categorized as a single service.

Beneficiaries: Identification of the beneficiary characteristics and their diversity, may result in differentiating even a single service to meet the needs of different groups. A uniform service to all groups which have varying needs in a programme is not likely to be appropriate. It should be noted that a high clientele diversity may call for limiting the groups to be served or designing separate programmes for these groups.

Sequence (Time and Area): As discussed earlier environmental complexity, diversity of clientele and service are also determining factors in decisions concerning sequencing the programmes in time and area.

2. **D-S-R Component:** This component deals with tasks that the programme organization must perform to attain the decided future state or goal.

This component calls for the examination of three tasks that a development programme, has to perform which are as follows:

i) Generation of public response to or demand for the service.

ii) Supply or delivery of the service.

iii) Mobilization of resources for the programme from key actors in the environment.

4.3 Structure

The design of an organization structure has to take into account the programme's environment and strategy. It should also be noted that there is no single structure that meets the implementation requirements of all development programmes and their strategies. On the basis of his study of six successful development programmes Paul hypothesized that "the performance of development programmes is facilitated by a speedy adaptation of their structures to their strategies. Successful leaders create or adapt their organizational structures to reinforce their strategies". The components of strategy that were described earlier are important factors in determining the scope of differentiation and integration of tasks. These together with the degree of decentralization are key factors in designing the structure.

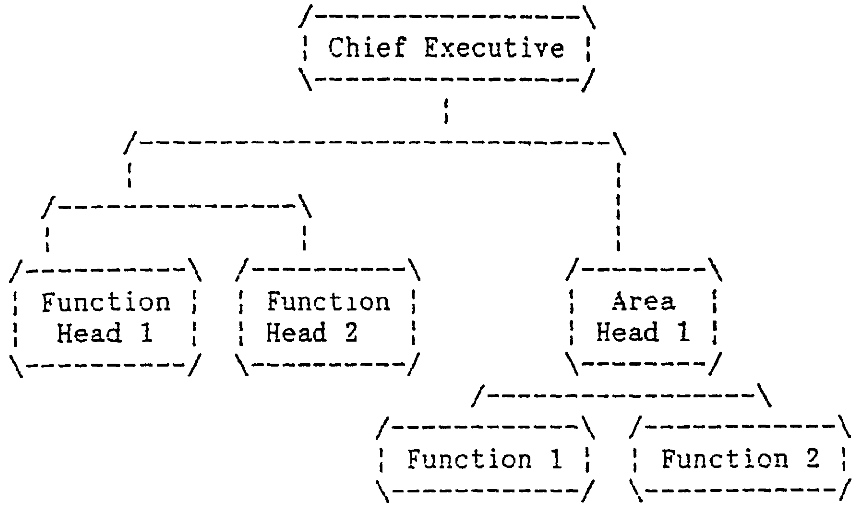
The three components of the structure variable are described here.

1. Structural Forms

Some important structural forms are described below and most organizations have mixed forms.

Functional Form: The organization is designed on the basis of functions underlying the service. This kind of structure is more appropriate in the case of single service agency.

Matrix Form: This structure involves a combination of regions and functions. Programmes that cover diverse geographical areas generally use structures that permit dual control over services and functions.



The matrix form permits more decentralization than functional form as authority is delegated to regional levels where functions are integrated. It should also be realized that the matrix form requires exercise of joint control.

Network Form: Most large scale development programmes involve a multiplicity of organizations as such programmes face considerable environmental complexity. To reduce complexity an inter-organizational arrangement (IOA) with no single organization in full control of the programme is adopted. This IOA includes the main programme agency and other institutions which jointly provide the service. In other words an IOA is "a formal collaborative arrangement of some enduring significance between two or more organizations or their parts". Such a structure calls for lesser use of authority for inter-organizational coordination. Sources of lateral influence such as use of funds, joint planning etc. are significant devices that are used to increase inter-organizational cooperation.

2. Degree of Decentralization

The extent of delegation of authority indicates the degree of decentralization. Decentralized structures are appropriate under the following conditions

i) Diversity of environment calling for local adaptation.

ii) Speedy programme responses are critical in generating participation.

iii) Central information processing is unfeasible and vital information is generated at the grassroots.

iv) Responsible participation of field officials and beneficiaries in programme planning and implementation aids better performance.

It should be realized that decentralization demands trained individuals for decision making at lower levels.

3 Organizational Autonomy

When the organizational processes for motivation of staff and beneficiaries differ from conventional practices and the programmes require performance of innovative activities, structures with autonomy are formed (These could be within the government department or outside). In the case of autonomous organizations, the governing body retains the strategic control (key appointments, goal setting review etc.) and the operational control is retained by the organization. Autonomy has two aspects.

i) Nominal Autonomy - as defined legally by the supervisory body.

ii) Induced Autonomy - when the organization derives autonomy in excess of its nominal autonomy on account of say the support from political leaders. Effective autonomy is the sum of both.

4.4 Processes

Processes in an organization may be defined as the "policies and procedures through which people in the organization receive a clearer indication of what the organization expects of them" (Ickis, 1978). These organizational policies and procedures are called as "operating mechanisms" (Thompson and Lorsch, 1970) viz. Systems of selection and firing, promotion, remuneration, performance evaluation, information and control and include training to staff and beneficiaries. In the case of development programmes, participation of beneficiaries also assumes critical importance. In the framework that we have used, the process variable of different programmes is examined in terms of the following components which are as follows·

1. Participation: To what extent the beneficiaries and staff take part in the planning and implementation of the programme indicates the level of participation in a programme.

2. Monitoring: This involves the flow of information upwards in the organization for analysis and feedback of decisions to lower levels.

3. **Human Resources Development:** Includes the selection and training of programme staff and beneficiaries. Generally, the selection of staff and compensation to them in programmes implemented by government organizations are bound by rules of the government rather than programme requirement. Hence we have not examined this aspect in our analysis.

4. **Motivation:** Includes the package of incentives, both economic and non-economic, to the programme staff and beneficiaries so that they do what the policies indicate must be done.

5. EVALUATION OF RURAL ENERGY PROGRAMMES

India has gathered considerable experience in developing and implementing rural energy programmes in last few years. Unlike some of the other rural development programmes the scope of rural energy programmes has been much larger from their initiation. They have also attracted political attention and have been able to involve voluntary agencies and groups working on appropriate technology development. The performance of these programmes has been a subject of public debate but there seems to be a basic agreement on the desirability of most of these programmes.

In this chapter we have used the framework outlined in the previous chapter to analyze some of the experiences of the NPBD, NPIC, biomass development programmes and other energy programmes to enable us to arrive at conclusions regarding their effectiveness in the field in achieving the objectives.

5.1 National Project on Biogas Development

In India, attempts at meeting energy requirements from biogas date back to 1900 when biogas technology was tried at a leper asylum. But the importance of biogas technology in meeting rural energy needs was realized only in the late 70s. The Fuel Policy Committee (1974) observed that a fairly generous estimate of the forest fuel resources puts the availability of forest fuels in 1978-79 to be around 94 MT as against the estimate of demand of 132 MT. It further pointed out that nearly 50 per cent of the total energy consumed is from non-commercial sources and bulk of it is consumed in rural India. The demand of cowdung was 65 MT and that of vegetable wastes was 46 MT in 1978-79. It strongly recommended that "all efforts should be made to intensify the popularization of 'Gobar Gas Plants' in suitable areas". It also identified nutrient production and absence of pollution as additional benefits.

The beneficiaries of biogas promotion were mainly farmers in rural areas and institutions. While there were a few research organizations involved in the development of biogas technology, action was initiated at the field by the KVIC. The KVIC operated through the Khadi Gramodyog Board at the state level. The service provided by the KVIC included motivation of beneficiaries, site selection, purchase of material and construction of plant, financial assistance through grant and loan from commercial banks at normal rate of interest, installation and servicing facilities. By 1974, just over 6500 plants were constructed (CEC, 1988). It is interesting to note that a study on biogas systems in India by T.K. Moulik (1979) pointed out that only 13% of the owners they surveyed knew about biogas plants before 1960 and majority of them came to know after 1970 (it is not very uncommon to see farmers ignorant of biogas even today). The following lacunae were identified in the supply of biogas programme.

i) Deficiency in extension - in manpower, both in strength and training.

ii) Poor maintenance and monitoring of working plants.

iii) Inadequate follow-up of services for repairing installed plants.

iv) Inadequate networking with other organizations, departments and particularly with financial institutions causing delays in loan disbursement.

v) One of the reasons for lower demand was the fact that farmers did not perceive economic benefits from biogas technology.

vi) Despite continuous efforts by KVIC to promote biogas technology in rural India, the technology was not widely accepted. Absence of a coherent national policy regarding biogas dissemination was cited as the main reason (CEC, 1988).

Given this background, the project (NPBD) was launched in 1981-82 under the Ministry of Agriculture. In the following paragraphs we use the framework explained in the previous chapter to analyze the NPBD.

5.1.1 **Environment:** The components of scope, diversity and uncertainty in the environment variable are discussed here in the context of NPBD.

1. Scope: NPBD as the name suggests was national in scope. Thus the size of the programme is large indicating a high complexity. It pursued a single socio-economic goal that of dissemination of biogas technology. This suggests that the NPBD is low on complexity of objectives.

2. Diversity: Given the fact that it is a national programme NPBD covers a variety of physical and geographical features. Political, economic and cultural differences also exist across the country. The above elements introduce heterogeneity of clientele who have different needs. Thus the programme has a high diversity. The elements of diversity are as follows:

i) Diversity in terms of language across the country.

ii) Village societies in India are differentiated by caste and income (Indicates segments having different needs).

iii) Only 22% of the rural households own five or more cattle and the potential users are scattered introducing logistical difficulties.

iv) Availability of land for construction of biogas plants varies across villages on account of clustered nature of dwellings.

v) The methods of grazing the animals, vary regionally and seasonally and has influence on dung collection. The production of dung also varies. These factors influence the availability of dung.

vi) The availability of water and other raw materials is also varied.

vii) The low temperatures in the northern belt add additional constraints on the promotion of the existing biogas technology.

3. Uncertainty: Though politically India is quite stable, one should say that the uncertainty facing the beneficiaries in biogas programme is high as monsoon failures can change the cattle ownership scenario of the villager e.g. droughts cause cattle deaths, sale of cattle due to reduction in income and lead to failure of biogas technology. Such uncertainties call for speedy information processing and adaptation to emergencies.

5.1.2 Strategy: In the following paragraph we discuss "Service-beneficiary-sequence" component and the "Demand-Service-Resource" component of the strategy variable.

1. Service-Beneficiary-Sequence: As discussed earlier, this component answers the following questions:

i) What is the service?
ii) For whom is the service meant for?
iii) When is it to be provided?

Service: The service which NPBD offers has following elements.

i) Extension and training element - Installation, demonstration of biogas plants and training in biogas technology.

ii) Service element - (Production and) supply of raw materials, components, maintenance and repair facilities, credit support to beneficiaries and institutions for providing the service.

iii) Technology element - Research and development of biogas technology.

The above elements consist of interdependent components like credit, making available quality raw material, installation support that reduce the uncertainties of the beneficiaries. The above elements can be considered as the strategic initiatives to popularize biogas technology.

NPBD covered the entire country from the start (1981-82) as it was a major programme under the Fifth Five Year Plan with the objective of consolidating the gains made during the earlier years in the propagation of biogas technology and to accelerate the pace of the expansion (DNES 1988). The formation of DNES and the subsequent transfer of NPBD from Ministry of Agriculture to DNES also did not alter its national coverage.

Given the high complexity of environment such a strategy was not advisable as the service (interrelated activities like credit inputs, site selection, installation etc.) described earlier was novel and called for great degree of integration. In other words, the complexity of environment called for a sequential approach with implementation in phases, covering a limited geographical area instead of covering the whole country.

It is interesting to note that the dairy development programme implemented by the Government of India covered only 18 rural milksheds despite the fact that the concept was successfully tested in Gujarat (Amul experiment) and the National Dairy Development Board (NDDB) was authorized to implement the programme nationally.

Beneficiary: As explained earlier, the environment of biogas programme was marked by high complexity on account of large scope and diversity of clientele. The beneficiary was the rural farmer. We will see later whether this identification of beneficiary has impacts on programme performance. On account of differences in the resource base, needs of farmers, and development of states varied, a differential subsidy structure (Table 5.1.2.1) was adopted. This is an example of development of strategy by matching it with the diversity of the environment.

Table 5.1.2.1: National Project of Biogas Development-Pattern of Central Subsidy for Biogas Plants for 1987-88

	Amount of Central Subsidy (in Rs.)			
Capacity of plant cu.m. of gas per day	For Arunachal Pradesh, Meghalaya, Manipur & Mizoram	For other North Eastern states, notified hill areas and desert	For other areas for scheduled castes, scheduled tribes, small & marginal farmers including landless labourers	For all other (General Categories)
1	2250	1500	1250	830
2	4410	2940	2350	1560
3	5490	3660	2860	1900
4	6580	4390	2140	2140
6	8020	5350	2610	2610
8	8020	5900	2850	2850
10	8020	5900	2850	2850
15	8020	6460	3100	3100

2. Demand-Supply-Resource Component

Demand: It is recognized that there is no direct flow of cash income to the beneficiary from investment in biogas plants. This is a constraint in adopting biogas technology. "Given the notional, indirect socio-economic benefits, investment in biogas plant has high opportunity cost as compared to investments in alternative income generating from inputs" (Moulik, 1979). Therefore energizing demand is a major task of the programme. Demand mobilization has two elements.

i) Ability of the beneficiaries

ii) Willingness of the beneficiaries

While the ability variable has been influenced to some extent by subsidies, credit support, efforts to reduce cost of technology by modifying designs and efforts to use different feedstock. The willingness variable can be influenced by information and advice to beneficiaries. A recent study of installed biogas plants in Bihar the staff of the KVIC (whose emotional commitment to biogas development is the highest) were found to be most effective promoters of biogas plants with 57-76 per cent installed through their encouragement. The village level worker and the Block Development Officer were responsible for 20.3 per cent of the plants whereas mass media motivated only 3.6 per cent of the owners. This is not implying lower role for mass media but underlining the need for a professional communication package. To illustrate, a professionally made audio-visual by TERI on biogas technology under UNESCO sponsored project screened on Doordarshan (Indian TV Network) farmers' programme and generated tremendous response and inquiries from farmers of states adjacent to Delhi.

Supply: The major components of the strategic interventions on the supply side of the service were as follows:

i) Involvement of promoters and turnkey supervisors of biogas plants: Promoters are selected village government functionaries and social workers from recognized voluntary institutions. The state nodal agencies and KVIC are the selection agencies. The functions of promoters include procurement of loan and subsidy, manpower for construction, contact fabricators and supervise critical stages of construction.

ii) Training of mason and turnkey supervisors in biogas plant construction.

iii) Emphasis on the involvement of a large number of government and non-government organizations in implementation of the programme.

iv) In addition, under NPBD a variety of models are being disseminated.

v) The last two aspects discussed above were perhaps responses to the environmental complexity we had discussed earlier.

Resources: The financial support for the programme by the allocation of Government of India to the NPBD is given in the following table.

Year	Allocation (in crore Rs.)
1983-84	14.94
1984-85	47.53
1986-87	62.50
1987-88	42.71

Credit support for investment in biogas plants was mobilized from key actors like RBI and NABARD. It should be noted that since 1977 the RBI has instructed banks to treat biogas plants as "agricultural priority" area. RBI directives also do away with security for loans not exceeding Rs. 5,000/- (net of subsidy). RBI and NABARD also provide refinancing to commercial banks for the above programme.

5.1.3 Structure: In this part we propose to analyze the structure of NPBD in terms of its i) structural forms and integrative mechanisms, ii) decentralization and patterns of authority sharing, sources of influence, iii) organizational autonomy.

Though the state level agencies involved in biogas implementation vary across the country, in the oncoming sections we focus on the organizational structure in the state of Haryana. The reason behind this is that the Haryana structure has influenced the structures adopted by many states in India.

The following organization chart provides a view of the structure for easy comprehension.

Organizational Structure

Level: State

High Powered Committee

Chairman (Chief Minister)

Members

Functions
Target fixing for each district

Secretary Agriculture	Director Agriculture	Managing Director Agro Industries Corporation	Secretary Agri-Mktg Board

State

Executive Department
(Dept. of Agriculture)

Director, Agriculture

Functions
Overall execution of the programme, planning and implementation of staff training; arranging supply of cement to customers & MS sheets & angle irons to fabricators; reviewing programme progress.

Deputy Commissioners of district	Agri. Engineer	Subject Matter Specialist (Fertilizer Promotion)	Working Group Director, KVIC

State

State Level Coordination Committee

Chairman (Either Chief Secy., or Secretary, Agriculture)

Representatives of Commercial Banks

Functions
Planning for loaning facilities in each district and allotment of areas to be covered by different banks.

Level: District

Deputy Commissioner

Deputy Director, Agriculture

All functionaries in Agriculture,
Development and Cooperation Department

Functions:
Overall implementation and supervision of the programme in the district.

District

District Coordination Committee

Chairman (Deputy Commissioner)

Members (Representative of
Commercial Banks)

Functions:
Fixing time schedule for sanctioning of loan applications, release of loans, inspection by the Bank staff, review the progress of loan disbursement.

District

Committee for fixation
of rates of fabricators

Chairman (D.C.)

Fixing rates for fabricators of biogas plants. Approval and assignment of fabricators to different banks

Asst.
Agriculture
Engineer

Asst. Soil
Conservation
Officer

Deputy Director
Agriculture
(Member, Secretary)

Level: Block

	Functions
Block Development Officer All functionaries of Agriculture, Development and Cooperation	Block level review and progress, loan processing and subsidy

			Functions
Gram Sevak or Agri inspectors	Khadi Board Supervisors	Quality Marking Inspector or Agri Department	Motivation of benficiaries and service delivery checking the quality inspection of gas holders

Source: Moulik, (1979)

1. Structural Forms and Integrative Mechanisms: At the state level the programme is implemented through the Department of Agriculture which has a functional structure. At district level the implementation is done through the Department of Agriculture. The Deputy Director (Agri.) reports functionally to Director (Agri) at the state headquarters but also coordinates with the Deputy Commissioner of the district. Thus we see the evolution of a matrix form of organization. In addition, a variety of other organizations like banks, KGB, the development and cooperation departments of the state government, NGOs are involved in the implementation of the programme. This indicates that a network of organizations operate in implementation.

First, at the state level the chairman of the high powered coordination committee acts as the integrative mechanism. This committee fixes the targets for each district. It is interesting to note that the

Chief Minister is the Chairman of this committee. Some of the other members of this committee in turn head other committees at the state level as is clear from the chart. These members act as linkpins between the committees they head and the high powered coordination committee. Third, at the district level the Deputy Commissioner of the district is the integrative mechanism for the various functions to be performed under NPBD. Fourth, the BDO plays the integrative role at the block level.

Given the nature of the programme which required inputs from different agencies we see the emergence of an inter-organizational network. Such a network requires the use of complex coordination mechanisms to improve inter-organizational cooperation.

2. Decentralization, Authority Sharing and Sources of Influence: An intensive study of rural development strategies and structures in Latin American countries by John Ickis (1978) indicates the need for a decentralized structure for effective performance. Hence it would be interesting to analyze the functions/tasks that are centralized or decentralized in the case of NPBD. We characterize the pattern of authority sharing on the following scale for key decisions. Highly centralized (HC) if decision is taken at the Central Level (DNES), Centralized (C) if decisions are taken at the State headquarters level, Moderately Centralized (MC) if decision is made at the district level, decentralized if decisions are taken at the block level(D). As implementation has been through networks, sources of influence other than authority have been used for coordination in the network. Our observations are summarized in Table 5.1.3.1 and 5.1.3.2.

Table 5.1.3.1: Patterns of Authority Sharing

	Functions/tasks	Degree
1.	Choice of technology for dissemination (Approval of model)	HC
2.	Allocation and control of funds	HC
3.	Planning and control of implementation (Fixing targets, allotment of areas to different banks)	C
4.	Supervision and control of field activities	MC
5.	Service Design (Specification of criteria, allotment of material like cement at fair prices, MS sheets,iron)	C
6.	Service delivery	D
7.	Training of masons and supervisors, staff	Partially Centralized
8.	Raising of resources	Partially Centralized

Table 5.1.3.2: Sources of Influence Exercised by Organizations in the Network

	Sources of Influence	Organization
1.	Allocation and control of funds	DNES
2.	Training and technology	Training and research institutes
3.	Political support	Planning Commission headed by the PM
4.	Monitoring and review	High powered coordination committee headed by CM of the state

First, DNES has control over funds which are needed by the state nodal agencies for implementation. Second, the training and research institutions have the technical expertise required for construction and improvement of biogas plants. Third, political support that is given to NPBD, underlined the importance of this programme to the network. (The Indian Planning Commission has the Prime Minister as its Chairman.) Fourth, monitoring and review of the biogas programme by a high powered committee headed by the Chief Minister (in the case of Haryana) of the state provided the Department of Agriculture influence over other members of the inter-organizational network in the state. A greater demand for the service from the beneficiaries would have resulted in making the network to respond better. This is possible only by strategic interventions.

3. Organizational Autonomy: NPBD did not have any legal autonomy as there is no separate organization at the national level for NPBD and is being directly implemented by the DNES, Ministry of Energy which is also the supervisory authority for other energy aspects in India.

5.1.4 Processes: In the following section, we discuss the components of the processes variable viz. 1) Participation, 2) Monitoring, 3) Motivation and 4) Human Resource Development.

1. **Participation:** The participation of beneficiaries appears to be quite poor in the implementation of the programme as the extension personnel deal with individual farmers and the village panchayat/villagers' organization does not seem to have any formal role in implementation (even an advisory one). It must be understood that the negotiation happens to be an important dimension of the participative

process. Such an approach underlines the need for negotiation and consensus building with local village institutions and farmers' organization for implementation of the programme. Regarding the degree of internal autonomy for organizations in the network, and the grassroots implementors the availability of information is limited to make any conclusion. Paul on the basis of his study of six successful development programmes observes that "Programme performance is facilitated when beneficiary participation, negotiation and internal autonomy of implementors vary in proportion to the complexity of the programme and the environment".

2. Monitoring: Collection of information and speedy availability of the same to the decision maker for analysis and action is the purpose of any monitoring system. Under NPBD, the emphasis of the monitoring system is primarily on the achievement of targets. This has led to poor quality of construction of plants and the objective of the personnel is more on the number of plants constructed than on the quality of construction.

The DNES has established a network of eight independent organizations located in different parts of India for evaluation of NPBD. It has also formed three monitoring cells at Chandigarh, Delhi and Jaipur. But studies conducted by these organizations are not available for analyzing the problems.

3. Human Resources Development: Though Human Resources Development has many elements we focus primarily on the selection and training of personnel. The selection of staff for the programme was not different from normal government procedure. The programme staff are all from governmental departments. As far as training is concerned, three types

of training programmes are conducted under NPBD. The target groups of these programmes respectively are as follows:

i) Promoters, state government functionaries and village functionaries.

ii) Turnkey supervisors.

iii) Masons

At present seven regional training centres have been established for the above purpose in different parts of India. Emphasis on training is a positive feature of NPBD but the quality of training material and the training methodologies can be improved substantially.

4. **Motivation:** As pointed out earlier biogas technology does not direct cash income to the beneficiaries so some educational methods have been employed. Beneficiaries are being motivated by visits by extension personnel and demonstrations in exhibitions, and subsidies have been provided for installation.

Promoters (Some chosen Government functionaries and social workers) are being paid an incentive of Rs. 30/- for motivating the beneficiaries and offering assistance in procurement of loan, subsidy and construction material. Turnkey supervisors and state agro-industries corporations, NGOs and trained private entrepreneurs who undertake turnkey construction of plants are paid a fee of Rs. 300/- per plant after producing a completion certificate.

We have rated the NPBD on the various components of the process variable in Table 5.1.4.1

Table 5.1.4.1: Analysis of Process Variable

Process Component	Rating
1. Participation	
i. Beneficiary participation	Low
ii. Negotiation	Low
iii. Autonomy of implementors	Not known
2. Human Resources Development	
i. Flexibility in staff selection	Low
ii. Emphasis on staff training	High
iii. Emphasis on training of beneficiaries	Low
3. Monitoring	
i. Speedy availability of information (Say, a non working plant)	Low
ii. Use of informal methods like field visits	Moderate
4. Motivation	
i. Direct economic incentives to beneficiaries	Moderate
ii. Economic incentives to staff	Low

Presently the extension network has the following weaknesses:

i) Inability to increase higher acceptance of biogas technology: This can be improved by improving extension with modern communication methods using audio-visuals.

5.2 National Programme of Improved Chulhas (NPIC)

According to the 1978-79 statistics there are about 110 million households (85 million rural, 24 million urban). Annually about 95.5 MT fuelwood, 71.7 MT of dungcakes, 30.6 MT of crop waste and 0.6 MT of charcoal are consumed as domestic fuels. About 90 per cent of the domestic energy consumption in rural areas is met by non-commercial fuels whereas it is a little over 40 per cent in urban areas. A total of 60 per cent of non-commercial energy needs are met by fuelwood (logs, twigs, wood shavings and saw dust) followed by dungcakes (21 per cent) and crop waste (16 per cent).

The evolution of woodstoves has been categorized by Smith in three phases,

- the Classic phase which focused on reducing smoke exposures
- the Energy phase which aimed at improving fuel efficiency as a response to deforestation, oil shocks and increased interest in appropriate technology
- the Phoenix phase which represents both the above approaches.

National Project for the Demonstration of Improved Cookstoves (NPDIC)

With studies favouring the introduction of improved stoves that held promise for reduction in fuelwood consumption, the Government of India introduced the NPDIC in 1983, a demonstration project as the name suggests with the following objectives:

i) Conservation and optimization of the use of fuelwood, especially in rural areas, by arresting the rate of deforestation and eliminating the drudgery of women. By eliminating smoke from the kitchen, the improved chulhas would also help in the upgradation of the environment and improvement of hygiene.

ii) Provision of employment opportunities in rural areas by training a workforce, especially of women in constructing improved cookstoves.

iii) Thrust in R&D activities to develop more and better quality stoves for dissemination,

iv) Introduction of training programmes for training master craftsmen in the construction of improved chulhas

As against a target of 5 lakh chulhas, a total number of 8.12 lakh chulhas had been constructed during the demonstration period. Upto January 1985, a total of 1547 training programmes had been held. 38 models of improved cookstoves developed by various research institutes and social organizations were designated for propagation. Political leaders also favoured the expansion of NPDIC as it provided a means to demonstrate their sensitivity to rural problems.

Given these favourable factors in the environment, the NPDIC was converted into the National Programme of Improved Chulhas in April 1985 (the demonstration project extended from December 1983 to March 1985). The DNES set itself a target of 50 lakh improved cookstoves for installation during the Seventh Plan period of 1985-90.

In the oncoming sections we apply the framework that was described earlier to examine the experiences gathered under NPIC.

5.2.1 **Environment:** The components of scope, diversity and uncertainty in the environment variable are discussed here in the context of NPIC.

1. Scope: The scope of the programme is large as it was a national programme even during its demonstration phase. Thus the size of the programme was large. Even though the main objective of the programme has been to conserve fuelwood and reverse deforestation, NPIC has other objectives which include:

i) rural employment generation

ii)providing better cooking environment.

Thus NPIC was marked by high complexity of objectives arising from the multiplicity of objectives outlined above.

Diversity: The major aspect of diversity is in the use of fuel. Table 5.2.1 gives a broad division of areas according to major biofuels used. It has also been indicated in the NCAER (study 1979) that people prefer to use fuelwood of all biomass fuels. Diversity is also found in the type of kitchen, utensils used and the design of stoves. There is a great deal of diversity in the use of traditional stoves. Examples of such diversity are:

i) Smoking of meat in North East India (States of Assam, Arunachal Pradesh, Nagaland, etc.).

ii) Water heating needs of the hills.

iii) Space heating requirements at high altitudes.

iv) Predominant use of single port stoves in roti making areas of India.

v) Use of multiple stoves based on different fuels in West Bengal, Haryana, Punjab, etc.

Though the improved stoves are developed for fuelwood, they are disseminated in households using any type of fuel. This has resulted in major design modifications by beneficiaries which can have a significant impact on the fuel conservation goal. Despite design modifications to suit some local needs, no information on the performance vis-a-vis fuel conservation objective is available.

3. **Uncertainty:** Since every household will be using a stove for cooking, the uncertainty component is limited to -

i) fuel switching i.e., households may shift from biofuels for better fuels like kerosene, biogas and LPG, etc.

ii) changes in kitchen or household

iii) modification of mud cookstoves periodically to suit use pattern and also due to regular use.

5.2.2 Strategy:

1. Service - Beneficiary - Sequence Component:

Service: The service in the NPIC consists of the following elements.

i) Extension element - This involves identification of beneficiaries, trainees and providing information to users.

ii) Technology element - This included development of improved cookstoves and a certification method for the same.

The technology element which involves the choice of stove using a method of certification of ICs which has the following criteria:

i) The thermal efficiency for portable models and community size stoves has been set at 25 per cent and 35 per cent respectively.

ii) It should be acceptable to the user.

iii) It should be easy to construct and low in cost.

It should be pointed out there exists a tradeoff between efficiency and emissions in choosing stove designs. Efforts by designers to improve fuel efficiency may in reality increase emission factors (Ahuja, et al, 1987, Smith 1987). So the certification method (that presently relies solely on thermal efficiency) should take care that modification to improve overall fuel utilization do not jeopardize combustion efficiency.

The thermal efficiency test is not adequater to ensure fuel saving over the traditional stoves. It will not be out of place to point out here that many post-dissemination surveys of improved cookstoves introduced in areas where traditional stoves cause large exposures have indicated that users perceive smoke removal as the largest benefit (Smith 1987). To some extent this indicates the divergence between planners' perceptions and rural people's perceptions

Beneficiary: The major beneficiaries of NPIC are rural women using biomass fuels. As pointed out earlier there is a great deal of diversity in the fuels used and in the type of usage. Poor identification of beneficiary characteristics and needs has led to major design modifications by beneficiaries and can affect the fuel conservation goal significantly. This indicates a mismatch between the environment and the strategy that has been adopted. Though designs have been modified to suit some of the local needs, information on their performance vis-a-vis fuel conservation objective is not available which is a symptom of poor monitoring. (dealt in greater detail elsewhere).

Sequence: NPIC was launched across the country covering the whole country with little attention to regional variations. This again is an inadequate matching of strategy given the complexity of the environment. Based on his intensive study in Karnataka, N.H. Ravindranath concluded that there were variations in cooking practices of Ragi, Rice & Jowar zones. He also emphasized the need for different models for different food zones in Karnataka as opposed to the present dissemination strategy in which the same ASTRA stove model is being disseminated in all the three food zones. Given the diversity and the uncertainty of the environment, it would have been advisable to limit the areas (say certain ecosystems) or could have been sequenced over a period of time in phases. Stoves could have been disseminated where wood was a major fuel for cooking and where cooking incorporates boiling operations. Such a strategic decision would have limited the managerial problems and would have led to better programme performance.

Demand-Supply- Resource component:

Demand: It is worthwhile to examine as to what are the "demand pulls" for improved cookstove technology from the point of view of women who use it. The benefits that a user may derive from adoption of improved cookstove are: smoke removal, fuel saving and saving in cooking time or a combination of any of these. However certain studies hint that the users prefer an improved cookstove more for its smoke removal feature than fuel efficiency. A Karnataka study (Ravindranath, 1989) indicated that 79 per cent of the households reported smoke removal as opposed to 28 per cent who reported lesser fuel consumption and 43 per cent who reported savings in cooking time: perhaps smoke removal influences the willingness of the beneficiary to adopt improved cookstove technology and the "demand pull" is weak from the fuel efficiency point of view for a user.

Studying the motivations for adoption of improved cookstoves (NADA model) Madhu Sarin arrived at the following data (Ref table 5.2.2.2) using a questionnaire which enquired the reasons for adoption before use and features liked most after use. It can be easily inferred that smoke removal and its resultant benefits have been reported as the major reasons for adoption of the technology and the feature that has been liked most after use. However, one can observe that the fuel savings has been given a lower rating after use. This can be on account of two reasons:

a) NADA chulhas are not fuel efficient

b) Fuel efficiency has a lower priority in the mind of a rural woman.

Reasons for adoption and what is liked most about chulha

Reasons		why adopted (per cent)	what is liked most (per cent)
1.	Smoke removal and associated benefits	65.3	72.7
2.	Fuel savings	46.0	20.6
3.	Time savings	14.4	24.0
4.	Personal comfort	12.7	29.4
5.	Unsure - watching others.	12.0	-

(The percentages do not add to a 100 due to multiple responses).

However Sarin has pointed out that the users have indicated during her survey that NADA chulhas were fuel efficient. Since survey methods rely on users' perception and recall of fuel efficiency which can be inaccurate we quote the results of a microlevel field experiment that was carried out in village Dhanawas (R.C. Pal et al, 1989) by TERI. The results among other things, indicated

a) The NADA chulhas were 12.74 per cent more fuel efficient than the conventional stoves.

b) The user provides a higher weightage to smoke removal from the kitchen than the fuel saving achieved. Therefore one can conclude the willingness of the beneficiaries to adopt improved cookstove is primarily on account of the smoke removal feature.

To influence the ability of the beneficiaries certain strategic decisions have been made. They are in the form of a subsidy for fixed mud stoves and the user is expected to pay Rs.10/- towards the construction of the stove. In the case of metal stoves the subsidy pattern is 50 per cent for general category and 75 percent for hilly areas and subsidy is subject to the limits of the unit costs approved by the department. However one does not have any data to conclude as to whether subsidizing the cost motivates more potential users to adopt cookstove technology. There have been variations in the amount charged towards construction cost (some of which have their own chulha programme) by NGOs and govt. functionaries at the grassroots level. This has led to unhealthy competition between different agencies undermining the dissemination process.

Supply: The major components of the strategic interventions on the supply side were as follows:

i) Training of master crastsmen and chulha mistris in chulha construction.

ii) Emphasis on large number of government, research/scientific institutions and NGOs in the implementation of the programme.

iii) A variety of models have been chosen for dissemination.

iv) The last two aspects are efforts (though partial) to match the environmental complexity which was explained in detail in an earlier section.

Resources: The budget for NPIC and the number of improved chulhas installed are given in Table 5.2.2.2.

Table 5.2.2.2: Budget for Improved Stoves

Year	Budget Rs, Crore	Chulhas Installed million
1983 - 85	*4.0	.8
1985 - 86	10.0	1.2
1986 - 87	6.0	0.9
1987 - 88	8.7	1.2 (target)
Total	28.7	4.1

*Note: The budget for 1983-85 is actually the budget for 1984-85 as no figure was available in 1983-84.

Structure: The structure of NPIC is analysed here in terms of its

i) structural forms and integrative mechanism

ii) decentralization and patterns of authority and sources of influence

iii) organizational autonomy

Before we start our analysis, a brief explanation of the structure is necessary. At the Centre, the DNES sets the framework within which NPIC in implemented. At the state level, nodal agencies or the Dept. of Rural Developoment or Dept. of Social Welfare is involved in implementation. There are variations across states in this regard. At the district level DRDA or Zilla Parishad is likely to be the implementing agency. At the block level, the BDO or CDPO is involved in implementation. There are also research institutes which act as technical back up units with the responsibilities of training, certification, technology development and monitoring. Involvement of a large number of NGOs was a strategic decision. In addition a large number of NGOs participate in training and implementation. The decision to include a large number of NGO was based on the following assumption/reasons

i) The nature of the technology and its maintenance and training requirements necessitated the involvement of organizations at the grassroots level.

ii)It was assumed NGOs were closer to the people particularly women and had a better record in implementation of rural development projects.

iii) Govt. agencies were already suffereing from system overload as they are expected to implement many development programmes.

iv) In addition, there is a general belief that organizational networks lead to better programme performance in rural development. Based on his study of successful development programmes Paul proposed that "Large development programmes operating in complex environments tend to perform better by relying more on interorganizational cooperation through the use of a network structures than on hierarchical control. Leonard has also pointed out the need for a newer organizational structure that complements the skills and resources of different organizations.

Therefore, it can be said that the structure of implementation of NPIC (to some extent rural energy programmes) is a major departure from all other rural development programmes: as it happens to be a large interorganization arrangement (IOA).

Problems faced in NPIC structure:

Although it was assumed that implementation of NPIC using an organizational network would lead to better implementation, some dysfunctional features have been observed which have been given as below:

i) Interorganizational conflict stemming from differences over reporting and the subsequent withdrawal of some technically strong NGOs from the IOA.

ii) Some NGOs which had other rural development programmes stopped implementing the chulha programme.

iii) Participation of fledgling NGOs in the IOA.

Given the unique nature of the structure of NPIC it is essential to understand the causes of such problems. Such an understanding will prove helpful in the organizational design of public programmes in future as public programmes are likely to involve populations of organizations. However, before we set out to analyze IOA problems in NPIC, a brief description of the different model for studying IOAs will be of utility.

There are three major models for studying organizational arrangements: (a) the exchange model (b) the political model (c) the organization set model.

However, the above models have certain limitations. Charusheela Naik based on her analysis pointed out the following aspects:

1. The exchange theory model is based upon a goal or intended, rational perspective which is applicable when participation in IOA is voluntary and when the relationship results in mutual gain for the interacting members.

2. The political economy model identifies four cooperative interactions which are influenced by political and economic forces and assumes that a balance of cooperative interactions leads to IOA equilibrium, the reason for which is not made clear.

Social Development Model:

After analyzing various issues in IOA and development literature she proposed a social development model to depict the functioning of a development programme administered by an IOA. The hypotheses of this model are as below:

i) The less measurable the output of a development programme administered by an IOA, the more complex will the style of managing interdependence (SMI) tends to be in the IOA.

ii) Among equally successful public programmes, the more social the nature of the output, the larger tends to be the repertoire of environmental coping strategies available to the decisionmakers of the IOA.

iii)The more social the nature of the services offered by an IOA for successful diversification, the more complex the SMI in the IOA will have to be.

iv) Under scale economy norms and clientele diversity, the higher the degree of mechanization of technology, the more complex will be the SMI.

v) For programme success, the more heterogeneous the client system of an IOA and the greater the multiplicity of its outputs, the more complex will be SMI of IOA need to be.

vi)The greater the heterogeneity of the client system of IOA, and the greater the number of the social goals, the larger the number of organizations involved in IOA tend to be and the more complex will the SMI need to be.

vii)Given low degree of sophistication of the client system the sharper the conflict between the objectives of an IOA and the traditional values of its client system, the more complex will SMI in IOA be.

viii)The more intense the competition faced by an IOA, the more professionalized and complex will be the SMI of IOA.

The above model is an Input, Output, Environment model which is useful in designing public programmes and developing appropriate SMIs among the members of the IOA. The Inputs, Output and the Environment variables used in this model are given below in a summarised form: (Charusheela Naik)

Inputs: Degree of sophistication of technology, degree of continuity of top bureaucrats across different administrations degree of field level discretion for implementation of strategy and degree of professionalization of personnel.

Output: Degree of measurability of output of IOA, nature of output (economic versus social), regional scope of output degree of multiplicity of output, perceived quality of output and degree of conflict with traditional values.

Environment: Sophistication of clientele, homogeneity of national culture, scarcity and presence of voluntary organizations offering similar service.

Application of the model to NPICs structure:

In the subsequent sections we have attempted to explain the functioning of IOA with reference to NPIC.

i) As it was observed earlier, that interorganizational conflict was observed over reporting. This IOA behaviour is mainly due to the fact, the nature of the NPIC is social and the output from it less measurable.

ii) Again on account of the social nature of the programmes the members of the IOA in NPIC were more decentralized. An implication of participation of autonomous organizations like NGOs in the IOA, is that such organizations adapt faster in the event of a changed environment. This is demonstrated by the withdrawal of some NGOs over differences in the method of reporting and some NGOs which had been implementing rural development programmes other than NPIC, initially participated in the IOA but withdrew subsequently as they realized that the implementation of the improved stove programme caused system overload.

iii)Given the heterogeneous nature of the clientele of the NPIC which has been discussed in detail in the section on environmental analysis, the implementation strategy will be less standardized as a variety of implementation-strategies will be followed by IOA members which in turn will increase the complexity of managing interdependence. In essence, it can be said that a blue print approach to NPIC dissemination is not likely to work on account of the diversity of beneficiaries and the IOA will have to allow for innovations in implementation by the members of the IOA for programme success.

iv) Given the recent decision to disseminate pottery stoves one can anticipate that the complexity of managing interdependence in the IOA will increase according to the above model. This is because the more mechanized the technology, the more will be the territorial coverage of the programme to achieve scale economies which in turn means meeting the needs of more beneficiaries (diversity of clientele). The above factors demand multiple skills which means participation of more organizations in the IOA.

2. **Decentralization, Authority Sharing and Sources of Influence:** Here we follow the methodology discussed in Chapter 4 as applied to the NPBD. The pattern of authority sharing in NPIC is shown in Table 5.2.3.1.

Table 5.2.3.1: Pattern of Authority Sharing in NPIC

Functions/tasks	Degree
1. Choice of model for dissemination	C
2. Allocating and control of funds	HC
3. Planning and control of implementation	C
4. Supervision and control of field activities	C
5. Service design	C
6. Service delivery	D
7. Training of supervisors	C
8. Training of SEWs	D

Table 5.2.3.2: Sources of Influence Exercised by Organization

Sources of Influence	Organization
1. Allocation and control of funds	DNES
2. Training and technology development	Technical backup units and implementing agencies
3. Monitoring and review	Internal feedback system as well as independent evaluations
4. Political support	20 point programme Election Manifesto

3. Organizational Autonomy: The NPIC is a programme implemented by the DNES and hence has no legal autonomy.

5.2.4 **Processes:** Here we analyze the NPIC in regard to 1. Participation, 2. Monitoring, 3. Motivation, and 4. Human Resource Development.

1. **Participation:** It has been pointed out (Agrawal, 1982) that a high level of user participation is needed to make the improved stoves acceptable. However, in the NPIC programme the participation of the users is there in a limited sense during installation. In most cases, even the village organizations are not involved in demonstration and selection of the improved models, decisions on amounts from beneficiaries. The model selection is made mostly at the state level, thus leaving very little scope for local adaptation.

2. Monitoring: In the earlier stages of NPIC, there was only one visit to be paid by the trainee for monitoring. Now there is provision for repair (0.50 Rs. per stove) and the remaining amount to be paid by the user. In practice it has been found that more extension monitoring is desired. In a report presented at the International Workshop on Stoves for People(1987) it is estimated that about 65 per cent of improved stoves are in regular use in different areas of the country. Fifty per cent of the users reported fuel savings and 75 per cent reported fewer health problems.

In an evaluation study in progress at TERI, similar levels of acceptance are found for improved stoves in Tamil Nadu, Rajasthan and West Bengal. In addition we observed that the improved stove designs are modified on a large scale to suit the local food items, fuels and other practices. It was also found that in a significant number of households traditional stoves are used along with the improved stoves. The fuel saving measured in the field is substantially less than that observed in the laboratory (Joshi, 1988; Pal and Joshi, 1988).

Feedback information on the performance of metal stoves is more scanty than that of mud stoves.

3. **Human Resources Development:** The scientific manpower involved in the development and certification of stoves largely derived from the universities and the technology institutions. They are also involved in training the trainers from different disseminating agencies. These trainers in turn conduct training at the local level to impart stove construction skills to the rural women. The training methodology has undergone substantial changes since the beginning of the programme and the present emphasis is rightly on developing a well trained long term personnel for implementation. However, the frequent design changes make it necessary that the skills are updated very frequently. This task is made harder as the material available for training is yet to be developed to meet the needs of a largely illiterate group of trainees. In metal stoves, the question of scale of manufacture to make the venture viable is not examined and the effort still seems to lack co-ordination between programme managers, the manufacturers and the buyers resulting in very adhoc development of local manufacture skills.

Currently the approach is to develop the potters' skills for stoves made in pottery. This programme is yet to be finalized and here again a regional approach would be essential.

4. **Motivation:** It has been found from the feedback studies that the main motivation of the users in adopting improved stoves has been its smoke removal feature. The users have also identified fuel saving,

cleaner vessels and clothes, savings in cooking time better thermal comfort as some of the other benefits.

The trainees who install stoves known as self employed workers (SEW) have an annual contract (Rs. 300/- per month) and are required to build 300 chulhas in a year. This system has evolved as a corrective measure to the earlier system where the dropout rate of trainees was very high. In addition to the monthly stipend, the SEW get Rs. 4.50 from the user for every repaired stove. This economic incentive is being tried out only recently and reports from the field on its impact on sustaining the interest of SEWs are not yet available.

The motivation of various disseminating agencies stems from the relevance of the programme to the largest group of rural households and also from the multiple benefits the technology offers. In fact, these features have favourably influenced the involvement of socially conscious scientists.

The rating of different components of process variable are given in Table 5.2.4.1.

Table 5.2.4.1: Analysis of Process Variable

Process component	Rating
1. Participation	
i. Beneficiary participation	Low
ii. Negotiation	Low
iii. Autonomy of implementors	Low
2. Human Resources Development	
i. Flexibility in staff selection	Moderate in the case of NGOs
ii. Emphasis on staff training	High
iii. Emphasis on training of beneficiaries	High
3. Monitoring	
i. Speedy availability of information (say, modification of an improved chulha)	Low
ii. Use of informal methods like field visit, feedback from beneficiaries	Moderate
4. Motivation	
i. Direct economic incentives to beneficiaries	Moderate
ii. Economic incentives to staff	Low

5.2.5 **Conclusions:** The realistic savings from the NPIC programme will be much less than the estimated 112 Crore Rs. by the DNES. A simple calculation follows as

Total number of ICs installed	= 4.00 million
ICs in regular use	= 65%
Saving in fuelwood	= 25%

Annual fuelwood consumption per rural household = 931 kg

Fuelwood price = 400 Rs./tonne

Therefore Total Saving = 4 x .65 x .931 x .25 x 400 m Rs.

= 24.2 Cr. Rs.

This is still a higher estimate as all the fuelwood used is not purchased. But if one considers other environmental benefits like cleaner cooking environment, better comfort, lesser health impacts the programme has a much wider scope and relevance. A few issues which need further discussion and a few suggestions to improve the programme are outlined below:-

i) It is apparent from the feedback studies and also from the changes in the stove designs and the strategies that the assessment of the technology status, the linkages between the fuelwood use and deforestation, the needs of dissemination were far from correct when the programme was launched. Even today the environment needs to be assessed more accurately to decide the objectives and the scope of the programme.

ii) The fuel saving stoves to i) bake rotis, ii) burn coal, iii) simmer milk using dungcakes are still to be developed.

iii) Emphasis should be given to develop stoves with cleaner combustion.

iv) The present certifying method should be extended to include a tests to estimate savings over conventional stoves in a region for regional fuel and cooking habits. The certifying methodology should have environmental parameters too.

v) The question of mud vs. metal stoves need to be evaluated considering following aspects

a) pollution (indoor/outdoor)

b) fuel saving

c) cost

d) present socio-economic context

It is felt that a few pilot studies in this direction over a period of 5 years may be worthwhile.

vi) The metal stove programme in the NPIC needs more specific objectives and it may be necessary to identify potential market areas and type of stoves to decide the manufacturing and marketing strategy.

vii) There can be region specific stove disseminating programme with greater emphasis on fuelwood consuming areas.

viii) In areas where fuelwood is not available and ICs for other fuels are not effective, programmes on ICs can be coupled with fuelwood plantations.

ix) The dissemination strategy can be incorporate clear guidelines on the methods for selection of improved stove models for a region.

x) The training methods can be improved, but the major constraints appear to be the constantly changing models.

xi) In view of the premature status of the technology it is desirable to monitor its performance closely, which may necessitate change in the present state scope of the programme. xii) Some implications based on our analysis are given below:

1. As we have pointed out earlier, there seems to be an undue emphasis on meeting targets which leads to poor programme performance. It should be borne in mind that any type of planning and control system has an impact on the behaviour of the staff. Therefore, programme managers of NPIC should take into consideration the extent to which targets can meet the programme objectives and the managerial effort required to achieve the

target (often field staff will be able to provide a realistic picture).

2. The incentives for staff should not just be based on the number of stoves constructed but also should depend on key variables like dimensional accuracy, performance and maintenance of stoves.

3. The structure that has been adopted for NPIC raises one major issue: how to maintain interdependence among a population of organizations to achieve programme objectives while not jeopardizing the goals of individual organizations. Levine and White have argued for "domain consensus" as a basis for cooperation. Aldrich and Whetten have suggested the need for linking-pin organizations that have extensive and overlapping ties with different members of the IOA. Such an organization has the following important functions:

i) Function as communication channels between organizations

ii) Facilitate exchange of technical resources and exchange of information

iii) Use its status to resolve disputes, articulate programme goals and the needs of members of the IOA.

In the case of NPIC such a role can be played by the research institutes that have been involved in the absence of a Council of NGOs (Bunker Roy's proposal a few years back that was opposed unfortunately). In the absence of a link-pin organization an action-set like a committee with the nodal agency, technical back-up and a representative of NGOs can be set up.

4. Given the nature of the programme and its diversity, NPIC has to expect and allow a variety of implementation strategies. An implication, is that the process of implementation assumes greater importance than just meeting targets. This will mean that the choice of organizations

for the IOA is critical. Organizations should be examined on case-by-case basis. Their goals, resources and technological capabilities should be compatible to the requirements of NPIC in order to become a member of the IOA.

Regarding the amount that is to be charged from the beneficiary, it is advisable to decide the same in consultation with village level bodies like panchayat. Though Margeret Skutsch has observed that there is no evidence if payment of an amount by the beneficiary leads to better maintenance of the stove or not, it is not preferable to provide any service free of cost in rural areas.

National Programme on Improved Chulha - 1988-89
Approved Models of Improved Chulha

Fixed Models

A. Family Size	Mud	Maximum Unit Cost (Rs.) With Pottery/pre-fab lining
(1) One Pot		
1. Sohni	40	-
2. Pawan	40	50
3. Gagan	-	50
4. Damru	-	25
(2) Two Pots		
1. Abhinav	40	55
2. Sugam (New Sahyog)	40	55
3. Sukhad	42	57
4. Laxmi (with grate)	52	66
5. Parishad	-	60
6. Tara-201	-	60
7. Magan/ Kallupatti	40	55
8. Patholy	40	55

Area Specific

9.	Uttara (with water tank for hilly areas	51		(without cost of water tank)
10.	Meghalaya (for North-East with Smoking Chamber)	70		
11.	Sugam-Metro (underground)	40	55	
12.	Sugam-Sewa (half underground)	40	55	

(3) Three Pot

1.	Astra	70	-
2.	Surbhi - L shape	40	60
3.	Rohini- L Shape	40	60
4.	Amolak- T Shape	40	60
5.	Parishad	-	70
6.	Kallupatti/ Magan	40	60
7.	Mahalaxmi	52	70

(B) Community Size

1.	Kesari - 200	70	Excluding cost of bricks
2.	Kesari - 50	70	- do -
3.	Gursevak	70	- do -
4.	Gursevak - 500	70	- do -
5.	Gursevak - 1000	70	- do -
6.	Sanik - 500	70	- do -
7.	Langar - 1000	70	- do -
8.	Thapoly (chapati making)	70	- do -

Portable Models

A. **Family Size**

Category I Mild steel and Cast iron: M.S. 16 SWG barrel with Aluminium lining of 22 SWG with cast iron top plate (in two parts) and cast iron grate.

Maximum unit cost : Rs. 100/-

1. Sun Brand
Suwib Energy Systems,
8-3-988/4, S.B.H. Colony,
Srinagar colony,
Hyderabad - 500 873

Category II Cast-Iron

Maximum unit cost : Rs. 120/-

1. Sun Brand
Suwib Energy Systems,
8-3-988/4, S.B.H. Colony,
Srinagar colony,
Hyderabad - 500 873

Category III Galvanized iron : G.I 20 SWG barrel with M.S Grate and Jali 16 SWG

Maximum unit cost : Rs. 78/-

1. Tara 101
Tara India,
22, Palam Marg,
Vasant Vihar,
New Delhi

2. **Community Size**

	Unit Cost	
1. Jumbo-Priyagni Junior	350	Orissa Renewable Energy Development Agency, 624, Saheed Nagar, Bhubaneswar
2. Jumbo-Priyagni Senior	550	Orissa Renewable Energy Development Agency, 624m Saheed Nagar, Bhubaneswar

Note

1. Metallic chimney made of 22 SWG M.S. sheet may be used for notified hilly areas depending upon the requirements of space heating etc. An additional amount of Rs. 35/- per chulha will be provided for this purpose.

2. Rs. 3/- per chulha will be provided extra, if pottery/pre fab tunnels, bridge, etc. is used in fixed type mud chulhas.

3. The unit cost includes the cost of chimney sealing and

5.3 Biomass development programmes

In this chapter we have organized Biomass development programmes in India under the following categories.

I. Evolution of Social Forestry in India

II. Application of the framework that we have used in the case of West Bengal.

I. Evolution of Social Forestry in India:

The issue of chronic scarcity of fuelwood and fodder has been raised at different periods in India. After consolidating their rule in India the British set about expanding their railway network for twenty years after the first war of Indian Independence in 1857. This resulted in large scale clearances of forests to meet the demand for railway sleepers and use of wood as fuel till 1906. Though some discrete endeavours were made to raise fuelwood plantations, the shortage became very clear to the colonial government that it initiated two steps:

i) In 1883 it recommended acquisition of lands to create village forests.

ii) The governemnt was willing to provide rent free lands for 20 years for those willing to grow trees. However, agriculture staked out its claims at the cost of the above initiatives and no lands was made available.

Dr. Voelcker in his report on Improvement of Indian Agriculture pointed out the use of dung as fuel and suggested the establishment of local fuelwood reserves. There were others like Wallace who questioned the government's efforts to grow large timbers which are of little use to the villagers. He argued that the "provisions of fuel as the most potent means of maintaining prosperity" and it should be undertakne urgently. Such suggestions were not heeded to as the colonial government was keen to meet the timber requirements of urban-industrial-military institutions and was not interested in forestry for rural development (Gadgil, 1989). It was soon realized that the contractors of both Indian and European hues were responsible for deforestation and that the forest reserves were not inexhaustible. This led to the formation of the Forest Department in 1864 to check deforestation during early British rule and to consolidate the forest estates and legislation in the form of the Indian Forest Act, 1865 was used to restrict the unbridled use of forest resources and as a symbol of assertion of State right by a colonial government (Guha, 1983). This coupled with the provisions of the Indian forest Act, 1878 which empowered the British rulers to define "privileges" in place of "rights" of forest use, the negative impacts of the colonial control of the economy by which India was converted into a supplier of raw material and the State's power to designate forests for particular uses led to a gradual erosion of both community control over them and resource management patterns evolved by the village communities (Gadgil, 1989).

5.3.1 Forest policy of 1894

The forest policy of 1894 was developed on account of the realization that the requirements of revenue is of secondary importance compared to the needs of the peasantry. However, it had to be consistent with imperial interests. As per this policy the Government-owned forests were classified with reference to their functions:

i) Forests for the preservation of climate
ii) Forests for commercial purposes
iii) Minor forests
iv) Pasture lands.

The above policy also ensured that the classification was not rigid and a forest may cater to multiple needs. (K M Tiwari, 1985).

Later a Royal Commission on Agriculture set up in 1928 recommended that the economics of developing fuelwood plantations had to be examined and plantations along canal banks could be established. It also observed among other recommendations that are pertinent to modern day social forestry (Shingi et al, 1986):

i) Minor wooded areas under the management of the Forest Department be handed over to village management.

ii) Creation of a special agency required to manage minor forests and to provide assistance to forest panchayats, forest societies, etc.

However, the above proposals were not totally implemented as the administration of forests was guided by the strategic interests of the British government during the Second World War. (Guha, 1983, Gadgil, 1989).

5.3.2 Forest Policies after independence in 1947:

After independence the Government of India outlined its policy relating to forests in its National Forest Policy, 1952. It considered the 1894 policy as a basis and modified it in view of the developments in the 20th century and in the light of national goals after independence. The 1952 resolution identified six national needs with regard to forests (Guha, 1983, Shingi, et al, 1986).

i) Evolving a system of balanced and complementary land use

ii) Checking denudation

iii) Establishment of tree lands

iv) Increase in supplies for grazing, small timber to the peasant and release of dung for agriculture

v) Sustained supply of timber etc. to defence and industry

vi) Realization of maximum annual revenue in perpetuity compatible with other needs outlined above.

While some authors like Shingi et al (1986), have observed that the above needs were aspirations of a young democracy, other like Guha (1983) have pointed out that it was not very different from the colonial forest policy.

5.3.3 Social forestry in Five Year Plans (1951-83)·

The First and Second Plans did not emphasize on development of fuelwood plantations. The Third Plan (1961-66) stressed on farm forestry and the development of village and extension forestry through village panchayats, seedlings being supplied by the Forest Department. However it was felt that progress was not satisfactory as the incentives were not adequate.

The Fourth Plan (1969-74) identified development of forests as a means of bolstering the village economy as one of the objectives in the forestry sector. The Fifth Plan (1974-79) and the report of the National Commission on Agriculture (1973) laid emphasis on Man-Made forestry with institutional finance. The differences between earlier artificial intervention to develop forests and the present recommendation were the scale of operations and the economic viability of the same (Shingi et al, 1986, Maslekar, 1985). Forest development corporations were set up and international funding agencies provided aid for developing man made forests under social forestry projects. The Interim Sixth Plan (1978-83) laid emphasis on generation of employment for the poor through forestry and economic development of the people in forest areas through forestry. The Sixth Plan (1980-85) realized the energy crisis and it called for the enhancement of fuelwood plantations.

Even though we see the emphasis on social forestry in the Five Year Plans since the Third Plan, Kondas (   ) has pointed out it was not included as part of rural development activities in the plans till the Sixth Plan. However, we see a gradual shift in the policy objectives to make forestry meet the needs of rural development. This is clear from the recommendations of the Task Force on Taking Forestry to People, 1980 and the objectives of the National Forest Policy, 1988. However, whether suitable strategies have been adopted to translate the above objectives into realities is beyond the scope of this paper.

II. Social Forestry Programme in West Bengal

The subject of the oncoming section is the application the framework that we have used for analyzing other programmes to the case of West Bengal. By clinically examining a successful case it is possible to derive and generalize some causes of success. We have used it here as there have not been many published and authentic analytical studies relating to the theme of our paper.

Forest products contribute greatly to India's economic development. Besides, wood is the most important source of energy for rural households in India. Forests also cater to the energy and raw material needs of many industries.

Forests in India supposedly cover about 22.7 per cent (74 million hectares) of the country's land area. About half of this is comprised of reserve forests and the rest of village forests which are under heavy grazing pressure and villagers' rights to collect forest produce. This has led to deterioration of forest area with the annual decline being estimated at 0.14 million hectare (Kalla, 1988).

The output from forest produce revealed the following trend on analysis.

i) A statewise trend analysis for a 17 year period (1961-77) indicated an increase in timber production at 4.36 per cent per annum at the national level. Barring a few states, the production of fuelwood has decreased.

ii) Bulk of the removals from forests are utilized as fuel and only 9 per cent of the wood is utilized for industrial purposes.

Given this background one would be in a position to understand the environment in which social forestry programmes are conducted in India.

5.3.2 Environment:

1. Scope: Social Forestry programmes are implemented in almost all parts of the country. Thus the size of the programme is large, which indicates a high complexity. Social forestry programmes in India pursue multiple goals which are as follows:

   i) Rehabilitation of degraded lands;

   ii) Meeting the fodder and fuelwood needs of the villagers;

   iii) Achieving the two objectives mentioned above with peoples' participation.

   Thus social forestry programmes in India were marked by high complexity of objectives.

2. Diversity: Social Forestry programmes cover a wide spectrum of physical and geographical features. The needs of various segments of the rural

society vary and thus the social forestry programme cater to a heterogeneous clientele. Thus the programme is marked by high diversity. The elements of diversity are as follows:

i) Type of land available for social forestry varies. The National Commission on Agriculture estimated 40 million ha. of wastelands which included lateritic soils (12 million ha.), water-logged areas (6 million ha.), salinity and sodicity affected areas (7 million ha.), ravines (3.7 million ha.), coastal sandy areas, stony and steeply slope lands (11.3 million ha.).

ii) The quality of soil across sites is varied.

iii) Availability of land for plantation in homestead plots varies across villages on account of clustered dwellings.

iv) Distribution of species across the country is also varied.

v) Methods of grazing of animals vary regionally and seasonally which have an influence on regeneration of forests.

vi) Ownership pattern of land also varies across the country.

3. Uncertainty: Uncertainty in social forestry programmes is high as failure of monsoon can lead to poor survival of plants particularly in areas with poor irrigation facilities. Poor availability of timely supply of quality seedlings, for plantation purposes in private and public lands also contributes to uncertainties. In addition, fluctuations of prices offered to farmers for different tree also contribute to uncertainties.

In the following sections we discuss the West Bengal Social Forestry programme implemented by the State Forest Department of West Bengal as their approach has interested policymakers on account of their flows of income to poor from social forestry programmes in the Western districts of Purulia, Bankura, Birbhum and western part of Midnapore which have laterite soils not recommended for agriculture (Tushar Shah, 1988).

5.3.3 Strategy:

1. **Service-Beneficiary-Sequence:** In the following sections we discuss the SBS component of strategy.

Service: The service had the following elements.

i) Motivating families of farmers who had received 'pattas' (surplus vested land distributed) to plant trees in contiguous plots.

ii) Provision of seedlings and one dose of fertilizer and pesticides free of cost by the Forest Department.

iii) Soil working etc. were to be done by the farmers.

Beneficiary: The beneficiaries were poor farmers/cultivating tenants who received surplus vested land under 'Operation Barga'. The identification of beneficiaries for land distribution was done with the help of local institutions and meeting villagers in group for selection of beneficiaries. The following table gives the break-up of surplus land distributed in the districts mentioned earlier.

Table 5.3.2.1: Land Distribution in West Bengal

District	Total Land Vested ('000 acres)	Area distributed till 1981 ('000 acres)
Bankura	420.7	38.8
Birbhum	97.7	20.4
Midnapore	765.7	162.8
Purulia	280.5	35.9

Source: Shah, 1988.

Sequence: 61 per cent of the total land under social forestry has been in the four districts mentioned above and 59 per cent of the total land under farm forestry is in the above districts. Focused efforts in these districts could have been in response to the high percentage of surplus vested land and suitability of land for agricultural purposes was poor.

2. Demand-Supply-Resource: As discussed in our framework of analysis, demand mobilization has two elements.

i) Ability of beneficiaries: This was influenced by providing 'patta' land to marginal farmers, financial incentives for surviving plants in the first two years and by emphasizing the planting of trees in contiguous areas which reduced protection costs.

ii) Willingness of beneficiaries: This was automatic as the 'patta' land were not suitable for agriculture and most of them were marginal farmers who needed additional income.

Supply: This element included supply of free seedlings, one dose of fertilizer and pesticides to the beneficiaries. Regarding resources we do not have adequate information to comment upon.

5.3.3 Structure: In West Bengal, there is no separate extension organization for social forestry. The responsibility of extension was carried out by territorial divisions before the Social Forestry project was launched. Presently extension is done by the following territorial structure.

Conservator of Forests
Divisional Forest Officer
Range Officers
Deputy Rangers/Foresters
Forest Guards

In some places in Social Forestry divisions there is a Range Officer for extension work in the Division under whom Forest Extension Workers are employed. Provisions have also been made to employ motivators, both men and women.

We have not applied the framework which we have used elsewhere for analyzing the structure for the following reasons.

i) Inadequacy of published information on these aspects.

ii) Mutations that are taking place in the structure presently.

5.3.4 Processes: In this section we analyze the process in terms of the components described earlier.

1. Participation: This has been high in the case of farm forestry programmes as economic benefits from this programme are quite high. Most of the beneficiaries were marginal farmers for whom additional income from 'patta' lands which are otherwise not productive acted as a major incentive. Since 'patta' lands were given on lease for 99 years (unlike 5 or 10 years lease in other states) it might have led to a feeling of ownership (Shah, 1988)

The Forest Department negotiated with farmers in groups. These are not formal village institutions, but group formation is the first step in institution building (It may be noted that many beneficiaries have presently formed marketing committees to avoid problems in marketing trees).

2. Monitoring: Here the emphasis so far has been on achievement of physical targets. While field visits constituted an aspect of information, speedy availability of information to decision makers has been poor. For e.g., many farmers had sold the trees for prices which were high for poor farmers, lower than market rates through middle men. Some farmers were not aware that the prices which trees command are related to their girth and finalized sale without waiting for sometime which would have fetched higher prices (Shah, 1988). Thus we can say speedy availability of information was poor.

3. Human Resources Development: The emphasis on staff training is high but the emphasis on training beneficiaries is low. Staff selection methods are similar to normal government procedures.

4. Motivation: Part of this has been discussed earlier. Economic incentives to farmers have been high while to staff has been low. Our observations have been presented in the following table.

Table 5.3.2: Analysis of Process Variable

Process Component	Rating
1. Participation	
i) Beneficiary participation	High
ii) Negotiation	High
iii) Autonomy of implementors	Not known
2. Human Resource Development	
i) Flexibility in staff selection	Low
ii) Emphasis on staff training	High
iii) Emphasis on training of beneficiaries	Low
3. Monitoring	
i) Speedy availability of information	Low
ii) Use of informal methods like field visits	Moderate
4. Motivation	
i) Direct economic incentives to beneficiaries	High
ii) Economic incentives to staff	Low

5.3.4 Suggestions for programme implementation:

i) Social forestry programme has made good progress in forestry on private lands but not so in community owned lands. Some beginning has been made to involve people and develop a farmer owned plantation management system. This calls for very different skills in which forestry extension personnel has to get trained (Banerjee, 1988).

ii) Marketing of trees require greater attention. Exploitation by middlemen reduces farmers' profits and can demotivate farmers. This again calls for marketing interventions by farmers' organization.

iii) The link between research and field should be strengthened as it leads to positive outcomes on both sides.

iv) Social Forestry Programme has inadequate manpower according to certain studies. (Banerjee, 1988). This has to be rectified.

v) Modern extension methods should be used for effective communication about tree farming methods and practices. Trained staff is an essential prerequisite.

vi) Social forestry programmes have been criticized for being anti-poor on account of their alleged bias towards rich farmers and meeting industrial needs. This again calls for policies favouring the poor as in the case of West Bengal and choice of species that meet the needs of the poor.

5.3.5 People Managed Forests:

Owing to the strict implementation of the Forest Acts, and infringement on the traditional rights of the people in the hills of Uttar Pradesh by the colonial government, there were large scale protests and burning of forests in beginning of this century. In response to the agitations spearheaded by Kumaon Association under the leadership of freedom fighter like Pandit Govind Ballabh Pant, a Forest Grievance Committee with Mr. Wyndham as Chairman. This committee recomended that Van Panchayats (forest panchayats) be formed to manage dereserved Class I forests (forests of no commercial value) and civil forests. The following table gives the distribution of Van Panchayats in some of the hill districts of Uttar Pradesh with area.

Table 5.3.5.1: Distribution of Van Panchayats in different districts by number and by area

District	Number	Area in hectares	Percentage to total forest land in district
1. Nainital	198	20718	5.20
2. Almora	1719	295889	66.47
3. Pithoragarh	983	62966	19.54
4. Paurigarhwal	662	37604	8.00
5. Chamoli	496	52149	9.89

Source: Forest Department, Government of Uttar Pradesh, Van Panchayat Afforestation Project (draft).

Van Panchayats are formed on the basis of a resolution by a majority of the "gaon sabha" and a subsequent inquiry and survey by revenue authorities. An informal election (no secret ballot) is held to elect the members of the Van Panchayat Committee, who i turn elect the Sarpanch. Van Panchayats are under the control of the Revenue department headed by the District Magistrate (DM) at the district level. He/she is assisted by the Sub-Divisional Magistrate (SDM) who has a Forest Panchayat Officer (FPO) under him/her. FPO is in turn assisted by a Forest Panchayat Inspector (FPI) who is expected to be a linkpin between the Revenue and Forest Departments and monitor the functioning of the Van Panchayats. Katar Singh and Vishwa Ballabh (1988) based on their study have pointed that the financial powers, technical knowledge and incentives are inadequate in comparison to the FPI's role and responsibility. However Van Panchayats suffer from some weaknesses· (Katar Singh et al, 1988).

i) Inadequate coordination between the Revenue and Forest Departments with regard to Van Panchayats.

ii) Erosion of the autonomy of Van Panchayats gradually through legislation.

iii) Encroachments of common lands have been noticed in some Van Panchayats.

iv) Absence of institution building efforts by FPIs.

Despite weaknesses, Van Panchayats do provide a clue and a basis for developing a people owned forest management system. It is interesting to note that the Royal Commission on Agriculture (1928) had recommended that certain categories of forest lands might be allotted to village panchayats to develop village forests as had been done in some southern provinces.

5.3.6 Forest Development Corporations and Forest Labour Cooperatives:

As we had noted earlier, the National Commission on Agriculture had recommended the development of high yielding, short duration man-made forest crops on forest lands, non-forest lands and private lands wherever feasible. This resulted in the setting up of autonomous Forest Development Corporations (FDC) which aimed to create man-made forests with institutional finance. Despite positive features like improved forest productivity, commercial accounting procedures and work norms, some lacunae have been identified (Maslekar, 1985).

i) FDCs remained departmental in approach and had no autonomy.

ii) Poor industrial relations as a result of which conflicts between deputationists and permanent staff of FDCs have been noticed.

iii) Need for better tax planning as profits of FDCs attract income tax.

Forest labour cooperatives (FLC) were formed in 1947, on account of the joint efforts of forest officers, cooperation experts and social workers to organize tribal labour for forestry work. In Maharashtra and Gujarat the above system has worked well as it has checked illegal felling by contractors and the social objectives are laudable. However Guha (1983) has observed that the percentage of work allotted to FLC has been low. Given the possibility of FLCs ensuring social equality and reducing the role of forest contractors, the National Commission on Agriculture had called for the expansion and strengthening of FLC.

5.3.7 Implications:

1. The above analysis shows that forest policies in India have come a long way since the colonial days and there has been a gradual shift in objectives to orient forestry to the needs of the rural people. To translate this into reality it has been recommended that resources will have to be managed and controlled by the community (Gadgil, 1989). However, in the light of erosion of values and traditional methods of resource management we have to study successful cases of traditional management of common property resources (includes water) identify their features and endeavour to replicate them.
2. As the West Bengal case has shown, a definite bias in favour of the poor has resulted in large income flows to them through forestry. Such policy changes, would necessitate organizing the poor. This can happen only if technological and institutional interventions are accompanied by structural interventions to change the present economic structure (Moulik, 1977).
3. For better implementation of forestry programmes for rural development we need an organizational structure that combines the technical strength of the forest department, institution building and extension capabilities of a healthy cooperative organization and the business capabilities of

commercial organizations. Such a structure has to be designed and evolved.

4. The job requirements of a forest officer has undergone several changes. From policing the forests it had evolved into a specialist with knowledge of trees. Presently a forest officer has to play the role of a forest technologist, an anthropologist when understanding the people who depend on forests, an advisor to other departments and NGOs which implement forestry projects, an institution builder while dealing with panchayats and a manager with a business sense while marketing forest produce and ensuring that the benefits flow to the poor. Such a complex role requires what Ickis (1978) calls as "metamanagement" capabilities.

5.4 Other Energy Development Programmes

The programmes discussed in the previous sections dealt with a specific technology or efforts to i) increase enduse efficiency, ii) promote new energy sources and iii) increase biomass supply in the rural areas. In this section, we discuss the interventions related to planning and management at the regional level. There are two major programmes, viz. - i) Urjagram programme of the DNES, and ii) IREP programme of the Planning Commission.

The IREP programme is discussed in chapter 3. The Urjagram (Energy village) programme promoted by the DNES aims to meet the energy needs of a village. The objective of this programme is to set up one Urjagram in all 543 Lok Sabha constituencies. At present 220 projects are in progress and 85 of them have been completed. The statewise break-up is Uttar Pradesh - 28, Maharashtra -16, Gujarat - 11, Madhya Pradesh - 10, Orissa - 6, Delhi - 6, Andhra Pradesh - 3, Tamil Nadu - 2, Tripura - 2, Bihar - 1. Under implementation are: Maharashtra - 30, Uttar Pradesh

26, Gujarat - 17, Madhya Pradesh - 14, Rajasthan - 12, Andhra Pradesh - 10, Bihar - 8, West Bengal - 7, Tamil Nadu - 6, Orissa - 3 and Delhi - 2.

It is apparent that there is a strong political component to this programme. In practice, the programme consists of selecting a 'suitable' village by conducting surveys and developing an energy development plan to meet the village energy needs using improved chulhas, biogas plants, solar photovoltaic systems, solar thermal systems, windmills, energy plantations and biomass systems. The energy available can be used for cooking, lighting, water pumping, running community television sets, primary health centres, cottage industries etc. Even in the IREP programme, the implementation is similar to that of Urjagram programmes only. In fact, the implementing agencies are the same.

At the implementation level, the rationale behind Urjagram and IREP seems to have undermined the linkage between the level of planning and the level of intervention (area coverage). The emphasis seems to be on the promotion of decentralized technologies alone without developing the necessary co-ordinating arrangements between the conventional and the non-conventional means for energy development.

The problems of maintenance are similar to those in other areas where same technologies are disseminated. These are comprehensively identified by Singh and Maheshwari (1989) and imply a need for a closer monitoring supported by a proper maintenance structure. It is difficult to develop such structures when Urjagrams are like isolated islands with dismal linkages for support.

In many situations, the users are not ready to assimilate the change and a mismatch between their perception of priority of needs and the energy development activities can be felt. Our experience has shown that developing different approaches for energy development for villages representing various energy situations will be a more rational approach (Kohli et. al, 1988; Suresh et. al, 1988). Such an approach underlines the fact that energy is a derived demand, it also demands a better co-ordination among organizations working to provide services and to promote economic development in the rural areas.

6. IMPLICATIONS

In this chapter, we have tried to put forward our observations on the identification of rural energy issues, the policy responses, the planning institutions and processes, the resultant programmes and finally their implementation.

The principle issues related to rural energy problem that have been identified by the policy makers are -

i) Acute deforestation has resulted in environmental degradation and causes extreme hardships to women.

ii) The scarcity of energy supply in the rural areas acts as a constraint to their economic growth and also inhibits them from achieving better quality of life.

While both these issues are valid, there is a great regional variation in the peoples' perception of energy problem depending on the economic development of a region, the resources owned by them and common property resources. In many rural areas, people are more concerned about water supply, roads and other basic services which results in a lower priority to programmes related to meeting rural energy needs.

In the electrified villages (75 per cent of the total villages), the issue is more of supply and extension of the grid to provide services like street lighting, community facilities etc. It is also one of the developing economic activities so that people can afford to consume more electricity for domestic lighting and other activities. In the remaining 25 per cent unelectrified villages the renewables have a role to play, provided the technologies can function with very little technical support/maintenance and are viable as compared to the extension of grid.

Improvements in enduse efficiencies for pumping, lighting etc. is desirable.

The common issue to all the biomass users is one related to the options for providing clean, efficient and cost-effective cooking energy. If one realizes that the LPG and kerosene are going to be limited for the vast majority, then biomass seems to be the only long term option. Among the cooking systems based on biomass, biogas to some extent offers itself as a long term alternative, but the technology needs further development to make it more convenient and also to improve its performance. As mentioned earlier, the uncertainty in the NPBD is large due to fluctuating cattle population in a family. This would be a major constraint in viewing biogas as a long term option for cooking fuel. There is a need to examine this further in the context of the role of animals in the rural economy. The NPIC programme is launched more as a response to the problem of deforestation than as an intervention to reduce the domestic energy consumption and as discussed earlier has not succeeded in addressing any of the questions effectively. Thus the policy makers are yet to address the question of cooking energy comprehensively.

The policy objectives are quite general and encourage the promotion of renewables. Their main concerns are environmental ones related to deforestation and the resultant degradation. The centralized planning exercise has not been able to respond to the regional variation in the rural energy situation. The linkage between rural electrification and energisation needs to be strengthened while planning for the rural energy development. This would necessitate different approaches in developing energy development programmes particularly related to IREP and Urjagram programmes. Though the IREP does take into account the conventional sources of energy, interventions are possible only through the RETs as the planning for the conventional sources is made at the state or the central level. Also the involvement of the Planning Commission in implementation (IREP) can be avoided since the programme eventually is to be transferred to some department of the government

The programmes have been designed at the central level to the last detail and are largely target oriented. The targets are fixed and sought to be implemented without regard to the necessity of developing an appropriate infrastructure as a precondition. A reversal of approach may yield better results in the long run. The building of state and district level capabilities can help in this regard. In fact, the area specific programmes can be developed at the state level under the broad guidelines from the centre. Instead of technology specific programme, it may be useful to develop enduse oriented area based approaches at the state level which can then be fine-tuned at the district level considering the local situation. The block and district officials can be trained to identify the energy needs of their areas.

While designing the programme, the technology status is often ignored. This results in two problems - i) the users are demotivated towards renewables due to imminent failures, ii) the efforts necessary to develop the technologies are undermined. This is not to say that the dissemination is not needed, but to point out a need to determine the scope and monitoring level commensurate with the technology level and other environmental factors.

In the implementation process, given the complexity of rural development in India, which includes a variety of interdependent functions, coordination has to trickle down to the field level among the members of the organizational network and with the beneficiaries. Normally structural responses like coordination committees are resorted to rather than process mechanisms, the designs of which require considerable skills.

Moreover, the integrated rural development strategies require the programme managers i) to understand the dynamics of the village society and design interventions; ii) to increase the capabilities of the poor by organizing them economically or politically and technically. These tasks call for an understanding of the role of programme managers as 'social change agents' and requirements of institution building. The points mentioned have indicate the need to upgrade the skills of personnel at the district and block level.

The present monitoring methods focus on achievement of targets which in many cases has resulted in compromise of quality. Quality has to be ensured by training the field workers and by decentralizing target fixing to the block level. This helps in better programme formulation by rationalizing the priorities at the local level.

Thus the challenge in rural energy development lies in developing institutions and mechanism that are capable of designing energy development programmes to meet the local needs in a sustainable manner. The processes of programme development and planning need to be decentralized. The state and the central institutes can play a co-ordinating and supporting role to provide technological inputs and to integrate the regional plans in the national energy policy framework.

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